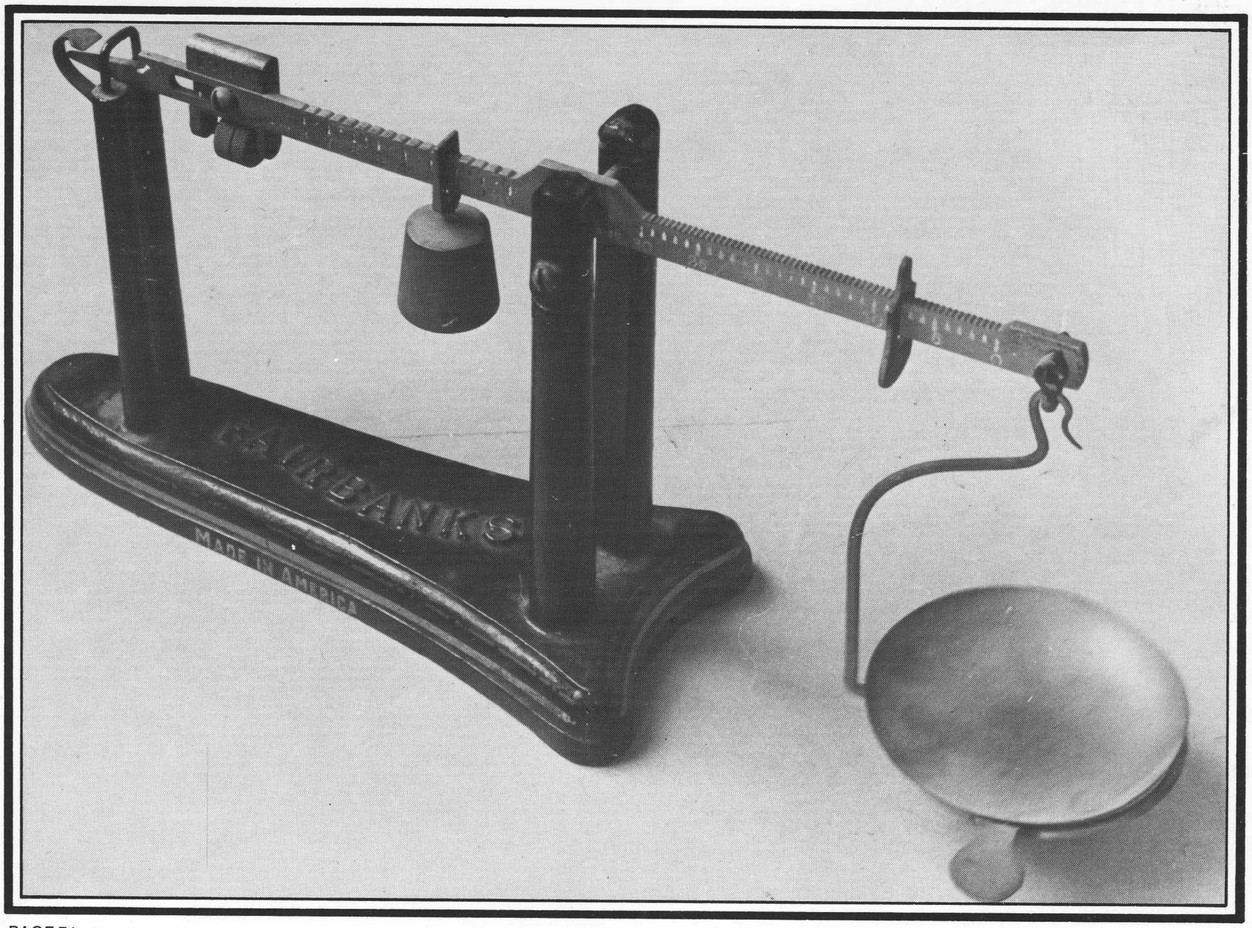
ISASC

EQUILIBRIUM

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

M.A. CRAWFORTH, EDITOR

WINTER, 197~~9~~8 H



INTERNATIONAL SYMPOSIUM

ISASC's first major international meeting is being planned for Saturday the 21st April 1979, in San Francisco, U.S.A. Six illustrated lectures, on various aspects of scales and weights, will be presented during the day and will subsequently be published. The meeting will be chaired by Bob Stein, and the Editor and his wife will be there to present two of the six papers (entirely due to the kindness and generosity of the three organisers, Bill Doniger, Joel Malter and Dick Wagers). Dinner in the evening will give people the opportunity to talk to fellow enthusiasts and their wives.

AUCTION

The Symposium has been timed to form a two-day event with America's first important auction of scales and weights, to be held on Sunday the 22nd April 1979. The main theme of the auction is 'American Gold Rush scales', but there are some superb European coin scales and a very varied selection of scales for many purposes. There is a most important section devoted to weights, ranging from Classical times to recent times.

Further details of this double event can be obtained from Joel Malter, P.O. Box 777, Encino, California, 91316, U.S.A. Tel. 213 784 7772.

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This meeting should give members an excellent chance to make new friends, discuss ideas for future events and to exchange duplicate scales.

COVER PICTURE

Prescription scale made by Fairbanks & Co, and illustrated in their 1902 catalogue. Graduations 0 - 8 drachm x ½dr and 0 - 30 grain x 1gr.

This model was imported into England and was submitted to the Board of Trade, in 1905, for proposed use as a dispensing scale. The Board declined to approve it for trade use, for a number of reasons, including "Counter steelyards are restricted for manufacturer's use under the Weights & Measures regulations.." The use of the scale for drugs or bullion "was not a suitable purpose because the weight of both classes of article must be determined by instruments of great sensitivity, a feature which the counter steelyard makes no pretence to possess" "Any accumulation of dirt or verdigris in the notches prevents the runner nesting in its true position and is sufficient to establish a greater error than could be tolerated." "...the balancing device has a range of adjustment out of all proportion to the capacity of the machine and might reasonably be held to facilitate fraud."

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

Bob Stein, Chairman — 20 North Wacker Drive, Chicago, IL, 60606 U.S.A.
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PROFILE - FAIRBANKS & CO.

PART 1.

SENT IN BY M.B.NEEDLE

The scene was the little settlement of St. Johnsbury, Vermont, in the year 1815. Over the hills a crude but sturdy waggon crept into view bearing a family of settlers - the family of Major Joseph Fairbanks, just in from far-off Brimfield in Massachusetts. The Fairbanks family were descendants of one Jonathan ffayerbancke of the West Riding of Yorkshire, who had migrated to New England in 1633 and built the quaint old Fairbanks house that, weathering wind and rain, still stands in Dedham.

Riding in the waggon were a nineteen-year-old boy, Thaddeus, his older brother, Erastus, and his younger brother, Joseph - the trio around whom the earlier stages of this story revolve.

For $300, Major Fairbanks bought five acres of land on Sleeper River, and the rights in the falls. There he built a dam and a small gristmill and sawmill on part of the site which, later, was to be occupied by the scale factory. After helping his father to set up his mill, Thaddeus began making waggons, one of which may be seen today in the museum at St.Johnsbury. In 1823, he started a small iron foundry, doing much of the work himself. A year later, his older brother, Erastus, gave up the country store he had established, and the two young men together began manufacturing waggons, ploughs and stoves.

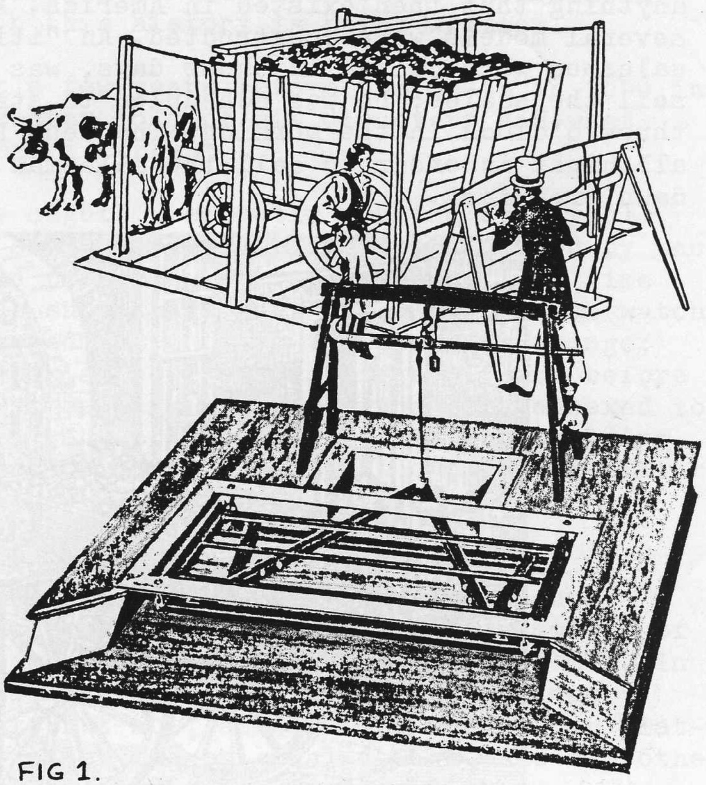

FIG 1.

In 1829 and 1830, a craze for raising hemp swept over Vermont, and E. and T.Fairbanks & Co. built three great Haynes machines for dressing hemp. These were 32 feet long and 4 feet wide, with 65 pairs of fluted rollers geared together, so as to break the hempstraw as it passed between them. The gear wheels and the machine for fluting the rollers were made by Thaddeus Fairbanks. He secured a patent on an improved hemp dresser and became manager of the St.Johnsbury Hemp Company. This was an unsuccessful business venture, yet it served a useful purpose for Thaddeus.

It was while weighing waggonloads of rough hemp, then valued at $15 per ton, that Thaddeus got his inspiration for his great invention. ▷

The weighing apparatus then in use was an adaptation of the old Roman steelyard, suspended in a gallows frame. Chains on the short arm of the beam were hooked on to the cart wheels, and weights were put on a tray suspended from the long arm of the beam - thus the load was balanced. Watching this painfully slow and laborious operation, Thaddeus pondered on ways to improve it. The first idea that came to him, was to construct a platform to be supported upon an A-shaped lever, with the tip of the lever connected to the steelyard by a rod.

Thaddeus dug a pit in which the lever was placed and suitably supported. The platform, balanced upon two bearings in the centre of the lever and level with the ground, was held in position by chains attached to posts opposite the four corners of the platform, FIG 1. This was platform number one - crude, as first attempts are apt to be, yet better than anything that then existed in America. A patent was applied for, and several models were constructed. An "itinerant agent", as travelling salesmen were called in those days, was engaged to go upon the road and sell the scales; he was scheduled to start from the inventor's home at three o'clock in the morning. Thaddeus Fairbanks made ready to sit up all night in order to call the salesman and make the fire for the pre-dawn breakfast.

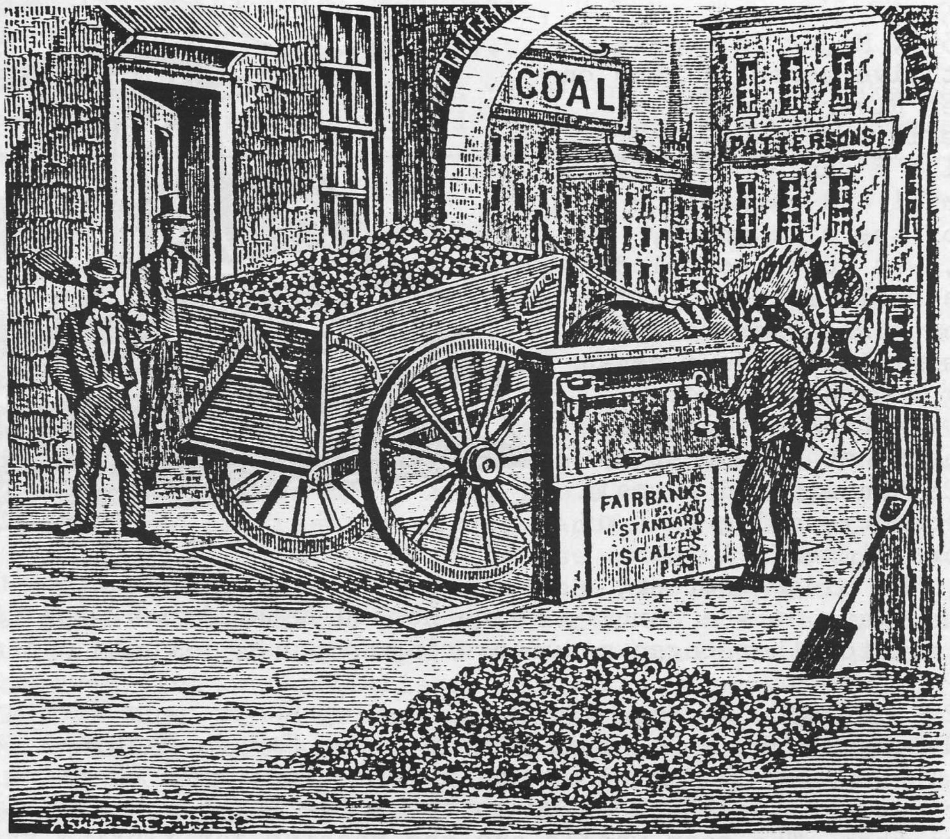

FIG 2.

The inventive mind often gets its best results at night. While waiting for the hours to pass, Thaddeus suddenly envisaged a scale so much better than number one, that he quickly woke first the "agent" and then his wife, telling them the former's trip would have to be postponed and there would be no need for an early breakfast. He was certain that with two A-shaped levers meeting at the steelyard rod, or hanging from one that hung upon the steelyard, he could secure four knife-edge supports for his platform, from all of which the leverage, as related to the steelyard beam, might be the same. He was right. The problem to be solved in weighing on a platform, is the accurate transmission of weight from anywhere on the platform by levers from the four corners to the steelyard - now called the beam - and the accurate graduation of the beam.

Next morning, Fairbanks remarked to his wife that he had discovered a principle applying to the scale, for which he would not take a thousand dollars. Thus, modestly, Thaddeus Fairbanks characterized the epoch-making discovery, which, by making accurate weighing with a platform possible, contributed an indispensable element of precision to all subsequent manufacturing operations, speeded immensely the pace of commercial transactions, and laid the foundation of the flourishing world-wide business about which this history is being written.

Half a century later, and just a few years before his death in 1886 in his ninety-first year, the inventor told of his discovery and what followed, in these intimate reminiscences:

"My plans were all made in the night, frequently working nearly all night. For lack of tools, the scale work all had to be finished by hand, and this, combined with work on patterns, etc. required all my time during the day. Faulty work was sure to be sent out unless I was watching all the time; men had to be educated to do the simplest things; there was no uniform machine work as now; it was fifteen years before we had a planer in the shop. Our casting was done in a shed annexed to the old forge; we were still in want of funds, but a larger building was finally put up; it developed on me to put in the cupola and fixtures, blast, etc., and start operations.

In making plans for scales, I found there were three things to be considered - the strength of materials, the best shape to secure greatest strength with least material, and the beauty and symmetry of outside appearance. To imagine what the tastes and notions of men, in reference to the right proportioning and beauty of this then new article would be, was difficult; but now, after fifty years, our platform scales are made precisely after the original design, and all other nations follow the same." ⊳

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Morton Needle collects and repairs clocks, and has a small but growing collection of scales. When sending this article he said : "Several American companies have their origins in the manufacturing and marketing of scales for commerce and industry, prior to 1900. They include the IBM Corporation, the Toledo Scale Co. and the Fairbanks Weighing Division of Colt Industies. My investigation into these and others, led me to focus on Fairbanks as the oldest continuous American source of commercial scales and related gear.

This story of the early years of the E.& T.Fairbanks Co. is an edited excerpt from their official company history 'Through the Years'. My thanks to Mr. K.F.Hammar, President of Fairbanks Weighing Division, for his assistance."

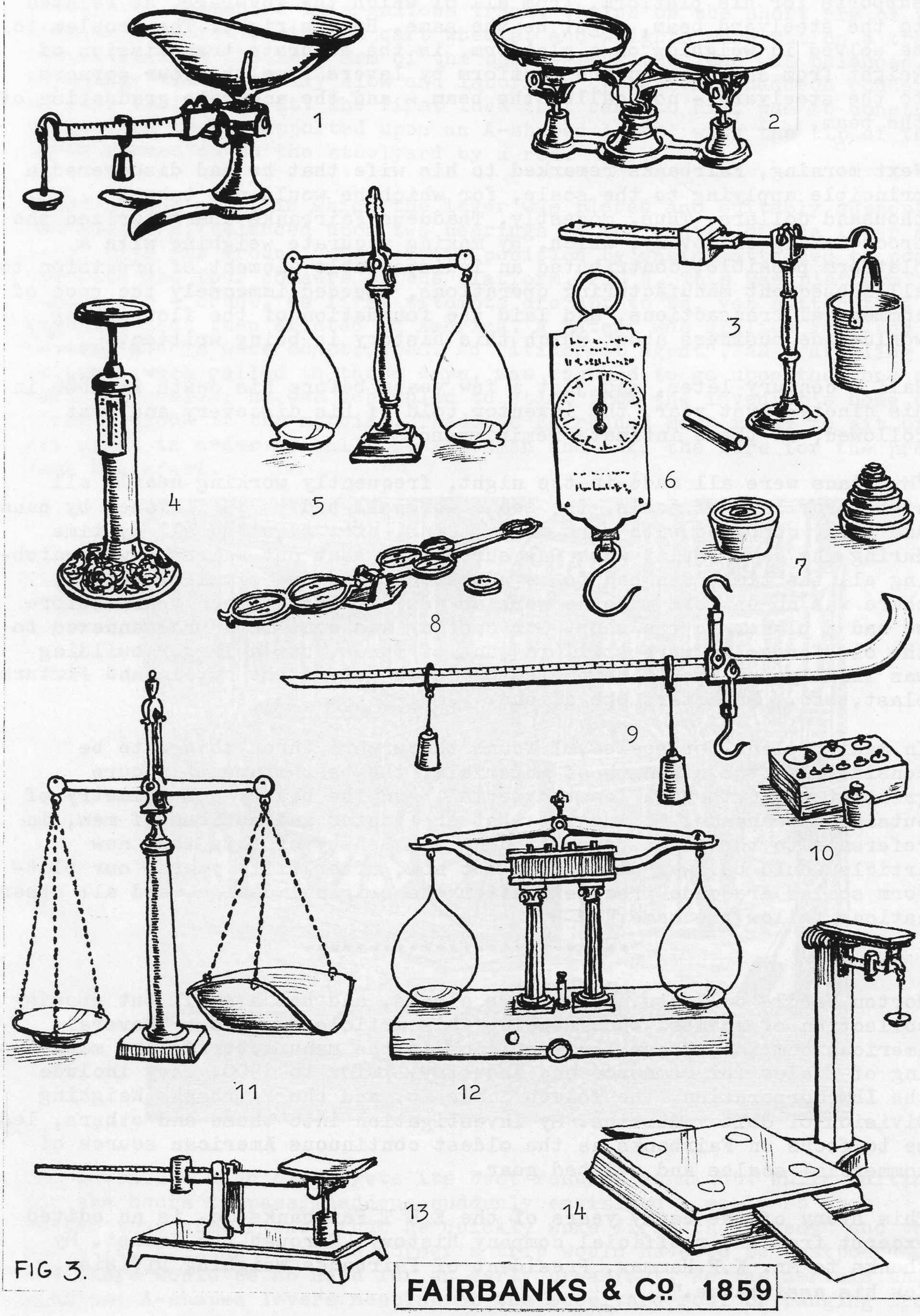


FIG 3.

FAIRBANKS & Co. 1859

OPPOSITE: A selection from the Fairbanks & Co. catalogue of 1859.

1. Counter scale. $\frac{1}{2}$oz to 36 lb - \$7.
2. Druggist's trip scales. 5, 10, 20 or 30lb. - \$ 3.50 to \$6.50.
3. Cornometer, graduated in lb per bushel. \$15.
4. Spring letter balance. 2oz - \$1, 4oz - \$1.50.
5. Prescription scales, basic version with 8 inch beam, \$10.
6. Circular spring balance, range from 15lb - \$2.25 to 240lb - \$18.
7. Brass cup weights, Troy, from $\frac{1}{2}$oz down \$0.38 to 32oz down \$2.50
   Nest weights, from 1lb down \$1.50 to 4lb down \$5.
8. Gold coin detector, Allender's patent. \$1.50
9. Weighmaster's beam, prices per 100lb capacity, \$0.75 to \$1.50.
10. Brass weights in block, Avoir. 1lb - \$5, 4lb - \$8.
11. Standard grocer's scales, 18 inch version, 10lb - \$9.
12. Bank scales. \$50 to \$500, mostly made to order.
13. U.S. Post Office balance. 8oz - \$3, 2lb - \$10.
14. Wheelbarrow scales. 1000lb - \$ 40.

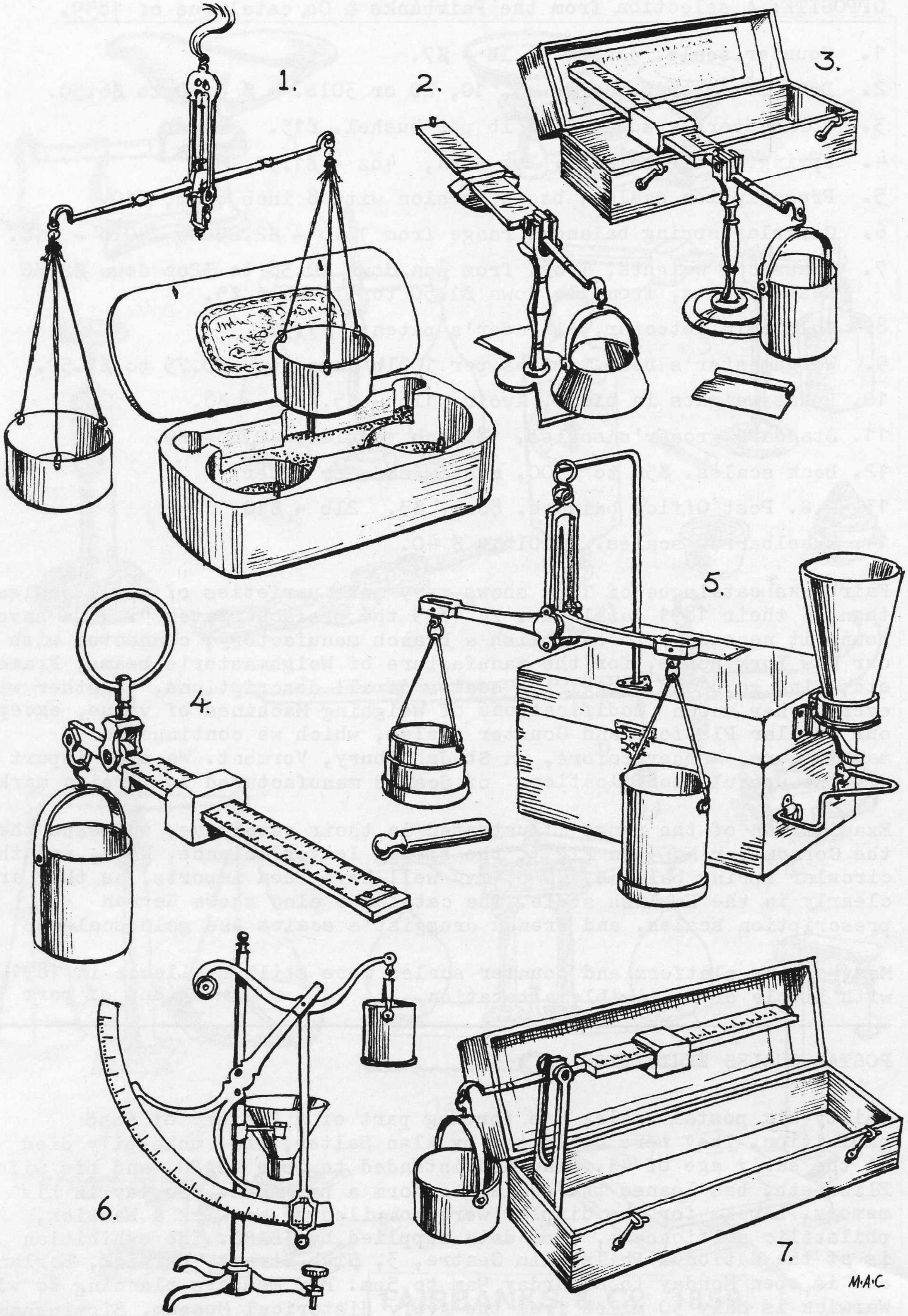
Fairbanks' catalogue of 1859 shows many more varieties of small scales than in their 1891 catalogue. In 1859 the preface states "... we have found it necessary to establish a branch manufactory, connected with our New York house, for the manufacture of Weighmaster's beams, Frames, etc, Fine gold and Druggist's scales of all descriptions, together with every other known modifications of Weighing Machines of value, except our regular Platform and Counter scales, which we continue to manufacture, as heretofore, in St.Johnsbury, Vermont. We also import all the useful modifications of Scales manufactured in foreign markets".

Examination of the range illustrated in their catalogue, suggests that the Cornometer No 3 in Fig 3, the spring letter balance, No 4, and the circular spring balance, No 6, may well have been imports, as they are clearly in the English style. The catalogue also shows German prescription scales, and French druggist's scales and gold scales.

Many of the platform and counter scales were still available in 1891, with little or no visible alteration. (End of part 1)

POSTAL SCALES EXHIBITION

Thirty-six postal scales are forming part of a History of Post exhibition. They were collected by Alan Salter, who, unhappily died at the early age of 41. Alan had intended to join ISASC, and his wife, Elizabeth, has loaned the scales to form a permanent display in his memory. Labels for the display were compiled by Warwick & Warwick, philatelic auctioneers, from data supplied by ISASC. The exhibition is at the National Philatelic Centre, 3, High Street, Warwick, England, and is open Monday to Saturday 9am to 5pm. For members planning to visit, Warwick is only 30 miles from the Avery Historical Museum, Birmingham.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M.A.C

GRAIN SCALES

BY M.A.CRAWFORTH

Following the article by Utz Schmidt (EQM p51-53) explaining the need to weigh grain and other seeds, here is a review of grain scales from various countries:

1. Thought to be an early English grain scale. Iron beam, brass buckets, fruit-wood case lined with dark red velvet. Made by John Snart, London. Royal coat-of-arms for the period 1707 - 1714, on the label.

2. Chondrometer with a conical bucket. Beam graduated 7 - 21 x $\frac{1}{4}$ unit. Origin unknown. arly 19th C ? The mahogany case is lined with coarse green cloth; instrument is dismantled for storage in the case. als Oaaten. in Oxford.

x 3. Typical English chondrometer, brass with beam graduated 21 - 79 x 1 pound per bushel. Mahogany case with detailed label of instructions for weighing wheat, rye, barley, oats, pease, small beans, Dutch-clover, and rape seed. Made by Benjamin Payne, London 1817 - 1827 EL*

x 4. American grain tester. A large hand-held instrument with three rows of graduations 0 - 65 lb/bushel, 0 - 21 lb x $\frac{1}{2}$oz, 0 - 100% x 1%. The latter is for determining the moisture content. Fairbanks & Co c 1930. see p. 79

5. Russian grain scale. The bucket is filled via the funnel clipped to the case. Maker unknown, 20th century.

6. German pendulum grain scale made for the English market. Quadrant graduated 0 - 72 lb/bushel. The design was patented in England, No. 13,852 of 1884, by Max Hedicke on behalf of the maker, Louis Schopper, of Leipzig.

x 7. English folding chondrometer. The column folds down flat inside the case, and the beam stays attached to it. Maker unknown, late 19th C.

8. Dutch grain scales. The buckets fit together to form a container for carrying the beam and weights. Maker unknown, 19th Century.

9. Swedish grain scales. The grain bucket is telescopic, so that the capacity can be adjusted for different types of grain. Maker unknown.

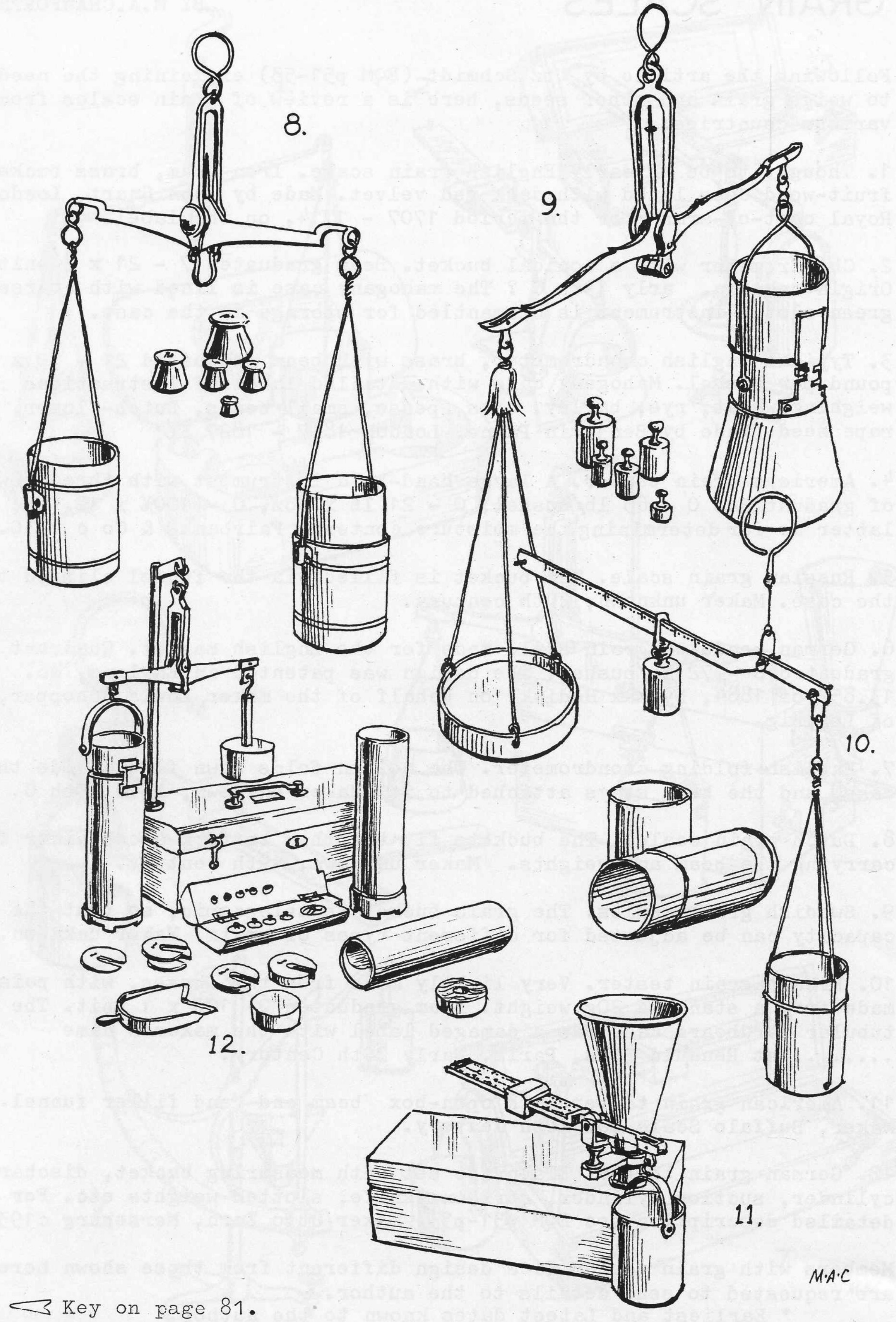
10. French grain tester. Very lightly made from thin brass, with poise made from a standard 20g weight. Beam graduated 0- 100 x 1 unit. The tubular cardboard case has a damaged label with the maker's name .... et Renauld Fils, Paris. Early 20th Century.

x 11. American grain tester with open-box beam end and filler funnel. Maker, Buffalo Scale Co. 20th Century.

12. German grain tester. Elaborate set with measuring bucket, discharge cylinder, suction cylinder, striking knife, slotted weights etc. For a detailed description see EQM p51-p53. Maker Otto Zorn, Merseburg c1938.

Members with grain scales of a design different from those shown here, are requested to send details to the author.

* Earliest and Latest dates known to the author.



◁ Key on page 81.

EARTHENWARE WEIGHTS

BY G.DICK.

Glazed weights made from a white earthenware, or stone china body, were first manufactured and used in England in the mid 19th century, when attention was being paid to hygienic conditions in food shops.

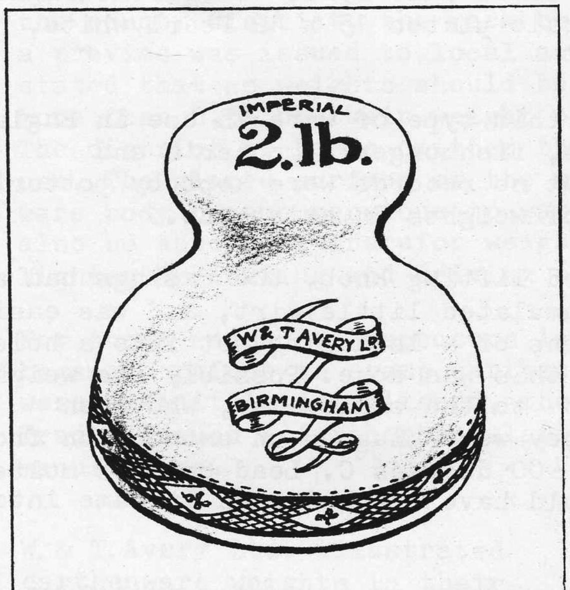


FIG 1 M.A.C

Before 1835, lead and pewter had been used for weights, but under Section 4 of the Weights and Measures Act of that year, their further use was prohibited, unless they were cased within a harder metal, such as iron or brass.

Presumably, this was because many tradesmen, in spite of an annual inspection of their weights, were giving short weight in goods, due to the unreliability of the soft metals. These deteriorated in use, when they came into contact with water, organic matter or salt. Cleaning fluids, often caustic, might also have contributed to the deterioration of the metal surface and consequent loss of weight.

No kind of pottery was included in the specification given for casing, but the great majority of local authorities accepted earthenware cased weights for use in their particular area, as this type of weight held many advantages over a metal one. The material was highly resistant to corrosive substances, chipping was easily visible to a customer when it occurred, and the denominations were clear to read; but above all, earthenware weights were hygienic, accurate and could be economically produced.

Soon after the issue of new regulations regarding materials permissible for the making of weights, Wedgwood developed white earthenware casings and began to manufacture them for such scale makers as Avery, Sangster, Salter and Day & Millward, who had already commissioned Wedgwood to make decorated scale plates and central pillars for their counter scales and inverted weighing machines.

Wedgwood was the only pottery to impress the base with a trade-mark, and they used a slightly different profile by which their weights can be distinguished from those made by other, unidentified, potteries.

Parnall & Sons Ltd, of Bristol, was the principal firm supplying earthenware weights to the London area, in the late 19th century. They may also have supplied weights without their own name, but with that of a customer, instead. Two such weights were found in a farm dairy at Broadstairs, Kent, with 'London Dairy Supply Co. Ltd.' around the base.

The first known date for the manufacture of earthenware weights is on a set in the Avery Historical Museum, which has 'X' impressed in the base of each weight. This is the code letter for the year 1842, according to the table of Registration marks. Further evidence lies in a reference to their manufacture in a trade catalogue of W. & T. Avery for 1849.

There was a thriving export trade to America, in weights and scale plates. For example, in a price book dated June 23rd, 1869, R.K.Wright of Philadelphia was supplied with 'Scale plates 15 x 12 Pearl white, 2/9,' and 'Scale plates 12 x 10, 1/10'

Considering the enormous quantity of this type of ware in use in England, between 1849 and 1870, in dairy shops, fishmonger's, grocer's and butcher's shops, it is lamentable that no records were kept by potteries, and that there are so very few sets of weights in existance.

Hemispherical, with a well-proportioned lifting knob, the casings had a pleasantly rounded profile which accumulated little dirt, and was easily cleaned. Weight adjustment was by means of a lead plug set into a hole in the base, but it is not known how this was done. Possibly the weight casings were sent from the potteries to the scalemaker, who then plugged them with lead; or perhaps they were plugged on extraction from the kiln, at a temperature of 300 to 400 degrees C. Lead becomes molten at 327.5 deg C. and a cold casing would have cracked when it came into contact with the hot metal.

Depending upon the denomination, the weights were made in varying sizes, graduating from the smallest, a 1oz weight 1.1" in diameter at the base and 0.9" in height, to a 7lb weight measuring 7.6" in diameter and 6.5" in height. There is also evidence of the manufacture of a 14lb weight, as reference is made to a "set of weights 14lb - 1oz in pure white, 24s 6d", in a catalogue of 1880.

This pure white, sometimes abbreviated in price books to 'WW', for white ware, or stone china, was usually known as Pearl White, and was also used for scale plates and pillars. A memorandum in the writing of Francis Wedgwood, in 1863, states "leave off the 'Pearl' and mark with a big 'P'. The recipe for this body was published by William Evans in 1846, in the 'Art and History of the Pottery Business': "Wedgwood's white pearl body = Brown clay 150 parts, Taylor's blue clay 200, Cornish clay 350, Cornish stone 76."

Many sets of weights were attractively decorated in blue, blue-green, or black, by means of underglaze engraved transfer printing, which had been in use since before 1765, and was revived with new enthusiasm in about 1810. The glaze itself was clear and glass-like, and was fired at a temperature between 900 and 1300 degrees C.

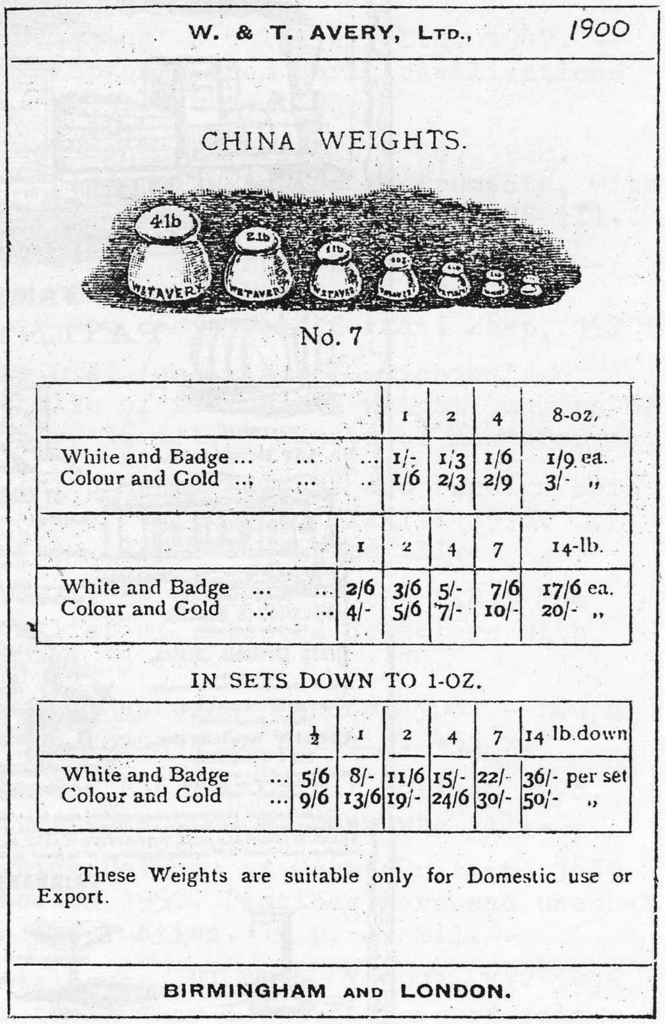
A circumferential band at the base of the weight was the most common type of decoration, with the scale-maker's scroll above it, Fig 1. Others bore floral designs, or were simply with a trade mark such as, Day & Millward, Birmingham, or W. & T. Avery Ld, Birmingham. The denomination was printed on the knob of each weight, sometimes surrounded by the words 'Imperial Cased Enamel Weight', Imperial Enamel Weight' or, simply 'Imperial'. In some cases, mistakes were made by printing 'lbs', instead of the authorised abbreviation 'lb'.

In the Avery Historical Museum, an example of a 3lb weight, made for some unknown purpose, was considered illegal by the Board of Trade and marked only with the obliteration stamp, a six-pointed asterisk, on the lead plug in the base. (The acceptable denominations eligible for verification were, 7, 4, 2, & 1lb, and 8, 4, 2 & 1oz).

Weights permitted for use were verified and stamped with the mark of the county district, the mark being impressed into the lead. In 1893, a proviso was issued to local authorities, by the Board of Trade, which stated that no weights should be stamped if they were found to absorb more than 0.5% of their weight of water, after immersion for ten minutes. The district of Leeds omitted this test for absorption, even though, in use, The glazed surface of the weight did develop cracks and the earthenware body became pervious to water. Humidity from the atmosphere could also be absorbed. Therefor weights, affected in this way, could be made lighter by heating and driving off the water vapour.

For these reasons, Inspectors in districts such as Manchester and London, began to refuse to stamp earthenware weights, and when the above defects were definitely established, the Standards Department of the Board of Trade issued a further regulation, in 1889, forbidding their continued manufacture.

W. & T. Avery Ltd. illustrated earthenware weights in their 1894 catalogue, but they did not appear in that of 1895. However, by 1900 they were again in their catalogue "for domestic use or export", only, Fig 2. In the Model Regulations of 1907, the use of them for trade was finally prohibited, and all weights were required to be of solid metal after 1909. Time was allowed during which such weights as were already in use might continue to be stamped, if found to be sufficiently accurate, and , as this allowance was extended indefinitely, in 1932, it is theoretically possible that earthenware weights may still be in use, because if they remained undamaged, and the glazed surface did not craze, they maintained their accuracy in an exceedingly satisfactory way, and had qualities of permanence which no other cheap commercial weight possessed. >



W. & T. AVERY, LTD., 1900

CHINA WEIGHTS.

4lb
W&T.AVERY

No. 7

	1	2	4	8-oz.
White and Badge	1/-	1/3	1/6	1/9 ea.
Colour and Gold	1/6	2/3	2/9	3/- ,,

	1	2	4	7	14-lb.
White and Badge	2/6	3/6	5/-	7/6	17/6 ea.
Colour and Gold	4/-	5/6	7/-	10/-	20/- ,,

IN SETS DOWN TO 1-OZ.

	½	1	2	4	7	14 lb. down
White and Badge ...	5/6	8/-	11/6	15/-	22/-	36/- per set
Colour and Gold ...	9/6	13/6	19/-	24/6	30/-	50/- ,,

These Weights are suitable only for Domestic use or Export.

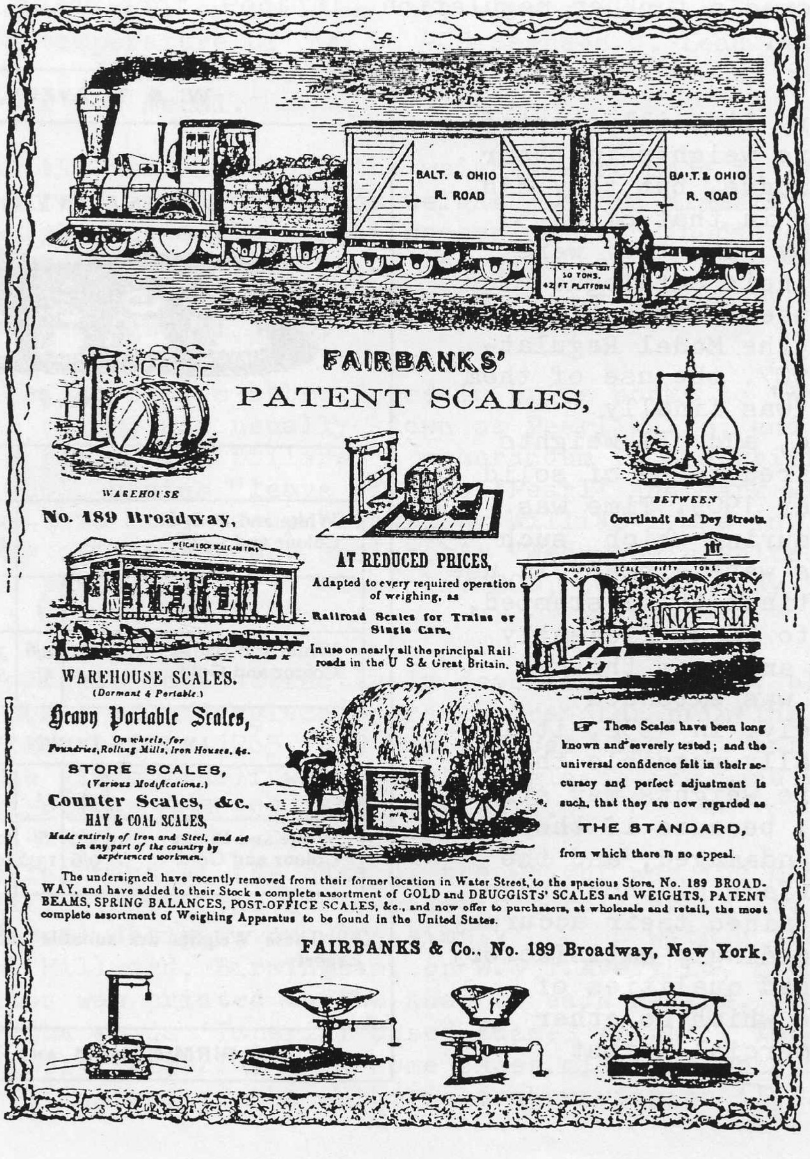
BIRMINGHAM AND LONDON.

Miss Gillian Dick did her research on earthenware weights for her college thesis and seems to be the only person to have studied this subject. We are indebted to her for collating such interesting evidence. Miss Dick is not a member of ISASC.

Would members having earthenware weights in their collection please send details of trade marks, decoration etc, to the Editor for a future supplement to this article.

OLD ADVERT.

This full-page advertisement appeared in THE ILLUSTRATED AMERICAN ADVERTISER *in the year 1856. E. and T. Fairbanks and Co. was among the first users of advertising space in the newspapers and magazines of the period.*



FAIRBANKS'

PATENT SCALES,

WAREHOUSE

No. 189 Broadway,

BETWEEN

Courtlandt and Dey Streets.

AT REDUCED PRICES,

Adapted to every required operation of weighing, as

Railroad Scales for Trains or Single Cars.

In use on nearly all the principal Railroads in the U S & Great Britain.

WAREHOUSE SCALES.

(Dormant & Portable.)

Heavy Portable Scales,

On wheels, for Foundries, Rolling Mills, Iron Houses, &c.

STORE SCALES,

(Various Modifications.)

Counter Scales, &c.

HAY & COAL SCALES,

Made entirely of Iron and Steel, and set in any part of the country by experienced workmen.

☞ These Scales have been long known and severely tested; and the universal confidence felt in their accuracy and perfect adjustment is such, that they are now regarded as

THE STANDARD,

from which there is no appeal.

The undersigned have recently removed from their former location in Water Street, to the spacious Store, No. 189 BROADWAY, and have added to their Stock a complete assortment of GOLD and DRUGGISTS' SCALES and WEIGHTS, PATENT BEAMS, SPRING BALANCES, POST-OFFICE SCALES, &c., and now offer to purchasers, at wholesale and retail, the most complete assortment of Weighing Apparatus to be found in the United States.

FAIRBANKS & Co., No. 189 Broadway, New York.

A BASIC LIBRARY

BY M.A.CRAWFORTH

1. KISCH. Bruno, 'Scales and Weights' Yale 1965. - The most important general reference book. Brief world survey of scales. Details of weights and their makers, mostly German and French. Mastersigns. Large bibliography. 297 pages, 97 ill. 10 charts.
2. STOCK. J.T. 'Development of the Chemical Balance' Science Museum, London 1969. - History of technical innovation in precision scales. Many aspects relate to scales in general. Excellent value. 50p,51 ill.
3. SHEPPARD.T. & MUSHAM.J.F. 'Money Scales and Weights' Mainly a descriptive catalogue of coin scales in Hull Museum. Brief history of English scales. Many drawings of rare types. 221p, 81 ill.
4. CRELLIN.J,K. & SCOTT.J.R. 'Drug Weighing in Britain c1700-1900' Medical History, vol XIII No 1. Jan 1969. Reprint from the Wellcome Foundation, London. - A short, but important and detailed work on English apothecary scales and weights, with dates. 67p 10 ill.
5. DIEUDONNE. A. 'Manuel des Poids Monetaires' Paris 1952.- Many details of European coin weights and their makers. Written in French. 174 p. 559 weights illustrated.
6. SANDERS.L, 'A Short History of Weighing' W & T Avery Ltd. 1947. - Briefly covers all important developments from early civilizations to the mid 20th C. 59 p, 52 ill.
7. OWEN.G.A, 'A Treatise on Weighing Machines' Griffin & Co, 1922. Explains clearly, the basic technology of weighing instruments, with illustrations of trade scales of the early 20th C. 202 p, 175 ill.
8. HAEBERLE.K.E. 'Zehntausend Jahre Waage' Bizerba, Balingen 1966. - Historical survey of scales, many German. Worth having for the attractive illustrations, even if you can't read German! 284p, 197 ill.
9. ZEVENBOOM.K.M.C. & WITTOP-KONING.D.A. 'Nederlanse Gewichten' Tijdstroom 1970. - Extensive details of scales and weight makers of the Low Countries, in Dutch. 255 p, 16 ill, 7 charts of mastersigns.
10. DUDLEY WESTROPP.M.S. 'Notes on Irish Money Weights and Foreign coin current in Ireland' Proc. Royal Irish Academy Vol XXXIII 1916. Includes makers, dates, legislation. 29p, 20 weights ill.
11. MALLIS.A.G. 'Counterfeit coin Detecting Devices of the U.S.' The Numismatist May 1974. Definitive list of patented detectors with drawings from the pat. specs. 20 p, 33 ill.
12. ROBERTS.J. 'Handbook of Weights and Measures' London 1908. - Law & Regulations during period of major changes in Britain. 451 p.
13. HOUBEN.G. 'European Coin-weights for English Coins' Holland 1978. Detailed survey with an unusual approach. 26 p, many wts. ill.
14. WORTLEY.R.K. 'Early Letter Weighing Devices of Great Britain, 1839 to 1899' Philatelic Bulletin, London 1950. Descibes rare and unusual postal scales, with some dating information. 14 p, 29 ill.
15. NUMISMATICA / WENDT. Auction catalogues, VI 1974, X 1975, XIV 1976, XX 1977, Vienna. Invaluable for their many illustrations of coin scales and weights, with dating information.

NOTES & QUERIES

NQ 14. SCOTTISH FLEUR-DE-LYS

Query from G.Houben.

In your article on verification marks, page 45, I did not find the fleur-de-lys mark used on weights in Scotland.

REPLY

from M.A.Crawforth.

The fleur-de-lys was a mark on weights USED in Scotland, but I have seen no evidence to show that these weights were MADE in Scotland. Considering the close alliance of Scotland with France, it is possible that the weights were made and stamped in France, where the fleur-de-lys was in common use, for export to Scotland. I would be interested in any evidence which indicates that the weights were made or stamped in Scotland, but in the meantime I do not feel justified in listing the 'Scottish' fleur-de-lys as a British mark. There are examples of its use in this country, however, as shown in the mark for Lincoln (p 94).

NQ 15. CHATILLON & SON INC.

Query from W.Lindeyer.

In addition to iron and brass steelyards, I also collect brass faced spring balances and milk scales. I am wondering exactly how many different spring balances were made by Chatillon & Son Inc, New York? Any information would be greatly appreciated. An inventory of my collection shows the following types;-

1. No.2. Pat. Dec 10th 1867. 48lb.   2. No.2. Pat. 10th Dec 1867. 24lb.
3. No. 2. Pat. Jan.6 1891, Jan. 26th 1892. 50lb.
4. as 3 but marked "Not legal for Use in Trade."
5. 'Improved Spring Balance' Pat. Dec. 10th 1867 24lb.
6. " " " 50lb.
7. 'John Chatillon & Sons Makers, New York, USA 'Not legal for use in Trade' 50lb.
8. 'Improved Circular Spring Balance. To weigh 30lb by ounces.' Milk.
9. as 8, but to weigh 60lb. Milk scale.
10. as 8, but to weigh 120lb. Milk scale.

Please would members send details of their Chatillon balances to Mr. Lindeyer.
Editor.

NQ 16. SIX OUNCE WEIGHTS

Query from M.B.Needle.

I have just acquired a postal scale about 12 inches across the plates, made of heavy brass and resting on an ornate oak base. The letter plate is engraved 4oz 1d, addl. 2oz $\frac{1}{2}$d. Can you date that postal rate ? I would guess it is from 1900.

Included with the weights, were two 6 ounce ones in postal style, but probably not original; why 6oz ?

REPLY From the Editor

The postal rates on your scale were current from 1897 to 1915 - but there is no need to guess in future, if you obtain the ISASC British Postal Rates data sheet, (for details see EQM p17).

Can any member help with the 6oz weights ?

NQ 17. EUROPEAN COIN

Query from G.Mallis

In any of your studies, have you come across weights for a European coin called a 'CRONTAL' ? If you have, can you tell me what it was and what it weighed ?

Can any member help Mr. Mallis ?

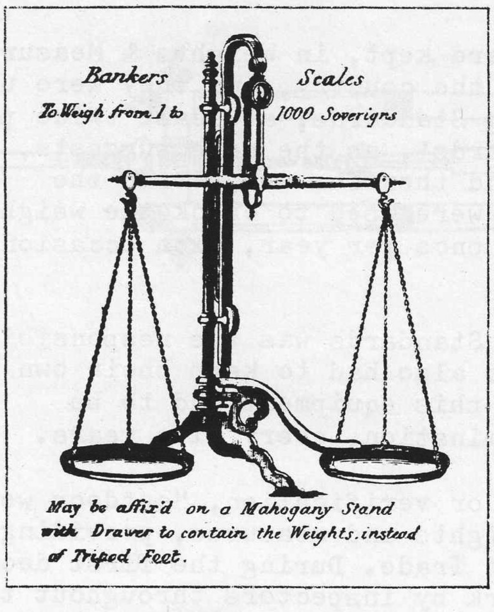
NQ 18. BANKER'S SCALES

Query from the Archivist, Lloyds Bank Ltd.

Lloyd's Bank Ltd have been asked to lend a banker's scale to a film company making a film set in the year 1855. In our store we have a number of scales from different periods in Lloyd's history, but none of them are dated. Please could you give me some idea of the type of scale a bank would have used at that time ?

REPLY From the Editor.

The most probable design in use in 1855 would have been a box-end beam suspended from a column, on a tripod base. Alternatively, the same instrument could have been mounted on a mahogany base with a drawer for the weights. Either type might have had a slide or a cord system for lifting the scales when weighing. An example with a slide is shown in the drawing from Wrightson's Biennial directory for 1830.


Bankers Scales
To Weigh from 1 to 1000 Soverigns
May be affix'd on a Mahogany Stand with Drawer to contain the Weights instead of Tripod Feet.

It is also possible that a beam with Sharkey ends could have been in use, although the design had only just been patented, in 1853.

Regarding the materials from which the instrument would have been made, iron is the most likely as it was in continuous use for box end beams from Rennaissance times to the 20th century. Brass beams were uncommon until the late 19th C.

I am sure you will agree that the value of Notes & Queries lies in the answers. When you reply to a query, please send a copy to the Editor so that it can be published to the benefit of ALL members. Ed.

BRITISH VERIFICATION MARKS

PART 4

BY M.A.CRAWFORTH.

Accurate verification, and uniformity of weights, scales and measures, can only be as good as, A) the Standards used, and B) the system for regular checking. The primary requirement is the preservation of a key Standard which forms the ultimate and definitive reference. The safeguarding of the British Standard was described in the Board of Trade Report of 1882. The definitive reference was the Parliamentary Standard for the Imperial Standard Pound, designated P.S. and there were four Parliamentary Copies designated P.C. 1,2,3, and 4. The latter were kept at the Royal Mint, the Royal Observatory, the Royal Society and in the walls of the Houses of Parliament. Each weight was a cylinder of solid platinum, with a shallow groove near the top, for lifting with special tongs. Fig 1. They were wrapped in Swedish filter paper, and stored inside glass and metal cases. Every ten years, they were compared with each other, using the most accurate scales that could be made.

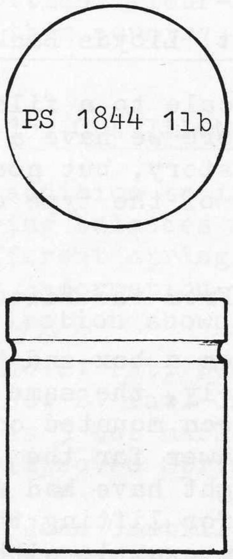


FIG 1. Full size.

The system for maintaining nationwide accuracy and uniformity was described in the first decade of the 20th century. 'Board of Trade Standards', for every denomination of weight, were kept by the Board of Trade Standards Department at their premises on Old Palace Road, London. They were used to check Local Standards at least once every five years.

'Local Standards' were kept, in Weights & Measures Offices, throughout the country, and they were used to check the Working Standards, at least twice per year.'Working Standards', as the name suggests, were in daily use and therefor subject to the greatest wear. They were used to check the weights and scales used by all traders, at least once per year, with occasional surprise checks.

The maintenance and adjustment of Working Standards was the responsibility of the Weights & Measures Inspectors, who also had to keep their own scales in order. As an additional check, this equipment had to be submitted to the Board of Trade, for examination, every five years.

Inspector's duties covered "indoor work" or verification, "outdoor work" or inspection, and the adjustment of weights and measures, providing the latter was authorised by the Board of Trade. During the first decade of the 20th century, a typical year's work by inspectors throughout the country, involved the verification and stamping of 3,394,042 weights and 311,467 scales. Countless traders were warned about infringements of the regulations, and there were 2,311 convictions under the Weights and Measures Acts.

During this decade, some counties, like Rutland, provided country ⊳

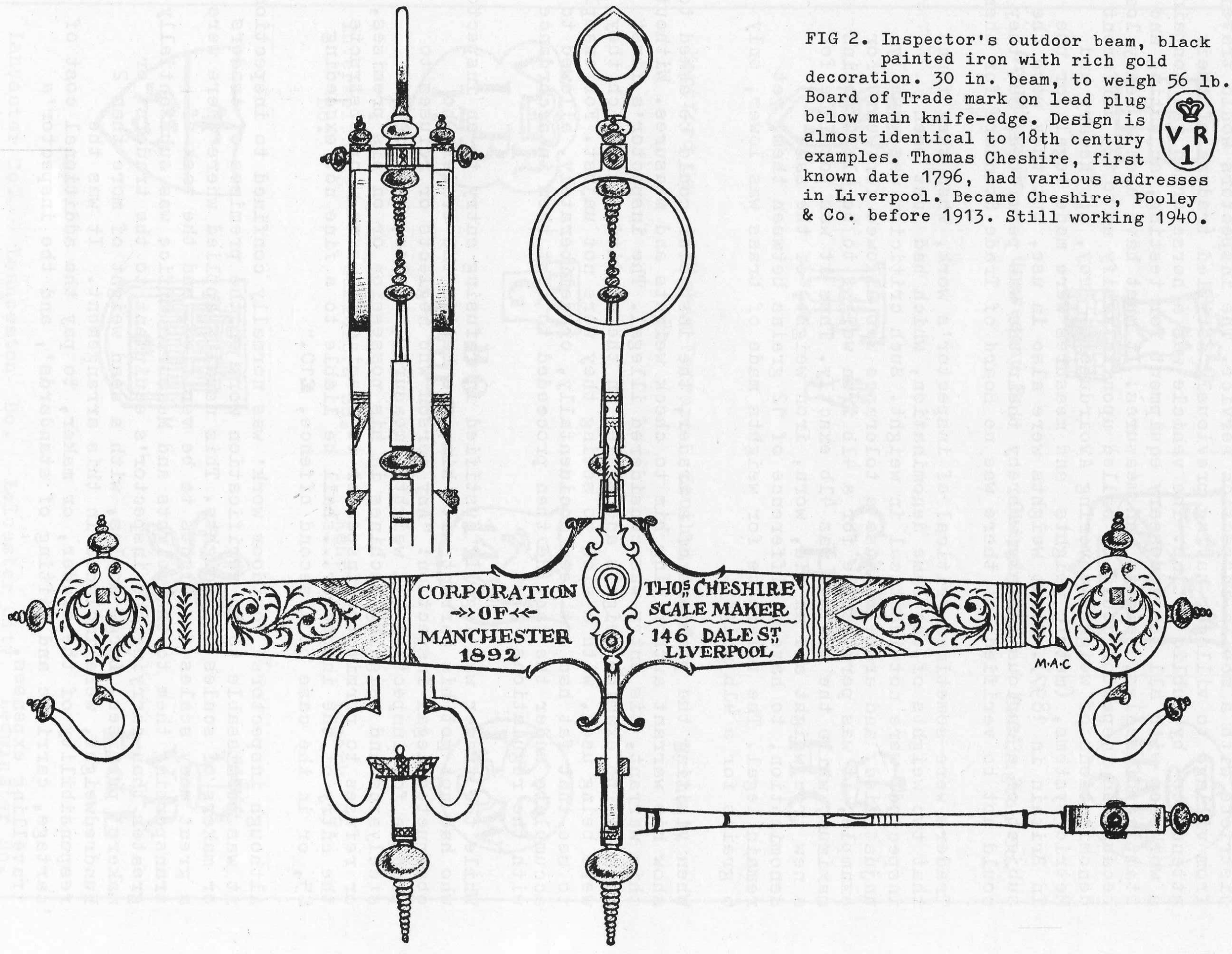


FIG 2. Inspector's outdoor beam, black painted iron with rich gold decoration. 30 in. beam, to weigh 56 lb. Board of Trade mark on lead plug below main knife-edge. Design is almost identical to 18th century examples. Thomas Cheshire, first known date 1796, had various addresses in Liverpool. Became Cheshire, Pooley & Co. before 1913. Still working 1940.

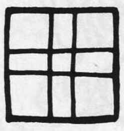
districts with a mobile inspection service. The inspectors would travel from village to village, having previously notified traders of their attendance by public notice. The vehicle was a horse-drawn van containing a workshop with all the necessary equipment for testing, adjusting and stamping of scales, weights and measures. It must have been a heavy load, because an inspector could be called upon to verify up to 123 different denominations of weight, covering Avoirdupois, Troy, Apothecary and Metric systems, (metric weights and measures were made legal for use in Britain in 1897). Carat weights were also in use, but they were the subject of a curious anomaly, whereby their use was permitted, but they could not be verified, as there was no Board of Trade Standard for them.

Traders were sometimes critical of inspector's work, when they found that two weights of the same denomination, which had just been inspected, were not identical in weight. Such criticism was usually unjustified, and arose because a tolerance was allowed for wear. For example, it was permissible for a 4lb iron weight to be 4lb 12grains maximum, while the minimum was 4lb exactly. Thus it was possible for a new iron weight and an old, worn, iron weight, of the same denomination, to have a difference of 12 grains between them, yet remain legal. The tolerance for weights made of brass was lower, only 6 grains for a 4lb weight.

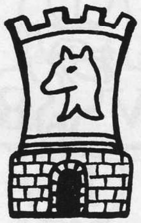
When visiting the premises of a trader, the inspector could be asked to show his warrant authorising him to check weights and measures. Without this warrant, his entry was considered illegal. The inspector's first task was to examine weights and scales in the condition in which they were being used, with a view to seeing they were not unjust. For example, to see that fat had not been accidentally, or deliberately, allowed to accumulate under the pan. He then proceeded to test them in accordance with the regulations.

While the trader was legally justified in refusing entry to an inspector who had not got his warrant with him, woe betide the trader who obstructed legal inspection! "Any person who neglects or refuses to produce for inspection all weights, measures, scales, balances, steelyards and weighing machines in his possession or on his premises, or refuses to permit the inspector to examine the same...or obstructs the entry of the inspector...shall be liable to a fine not exceeding £5, or in the case of a second offence, £10."

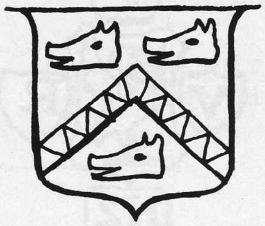
Although inspectors' 'outdoor work' was normally confined to inspection, it was permissable to do verification work on the premises of traders or makers of scales and weights. This usually applied where there were a great many scales or weights to be verified, and the task of transporting them to the Weights and Measures Office was substantially greater than carrying the inspector's equipment to the traders' or makers' premises. Large scales, with a dead weight of more than 2 hundredweight, were included in this arrangement. It was the responsibility of the trader, or maker, to pay the additional cost of 'cartage, carriage and lifting of standards', and the inspector's travelling expenses.



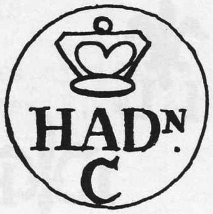
Grantham Bo.



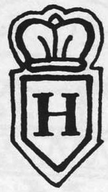
Gravesend Bo.



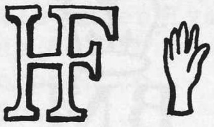
Grimsby Bo.



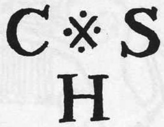
Haddington Co.



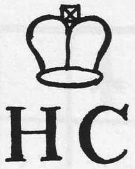
Hertford Co.



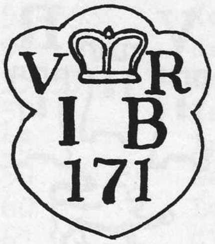
Higham Ferrars Bo.



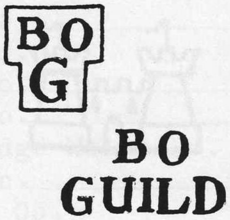
Southampton Co.



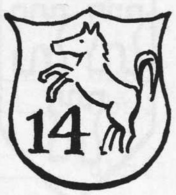
Hythe B.



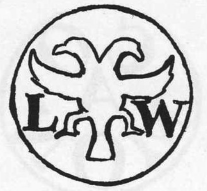
Inverkeithing Bo.



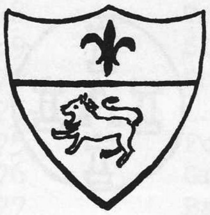
Guildford Bo.



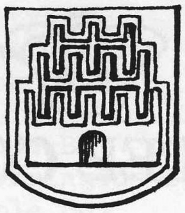
Kent Co.



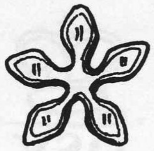
Lanark Co.



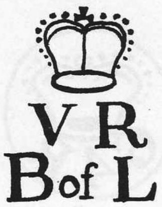
Lancaster Co.



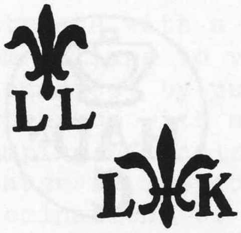
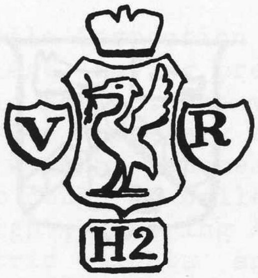
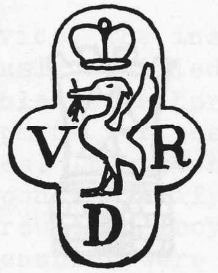
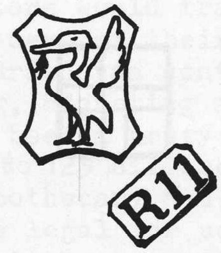
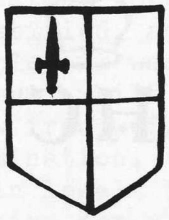
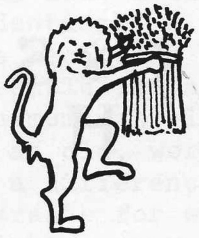
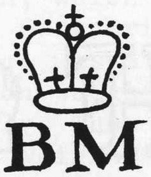
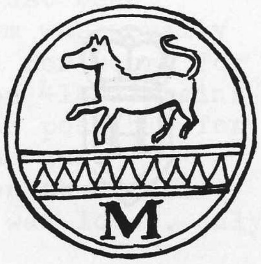
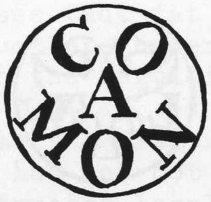
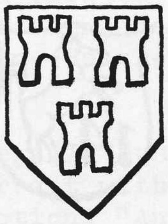
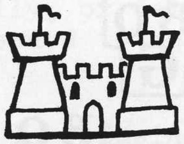
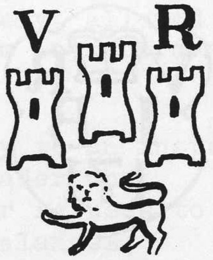
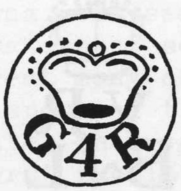
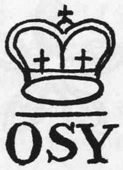
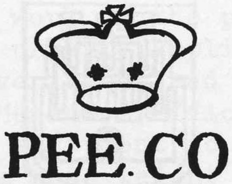
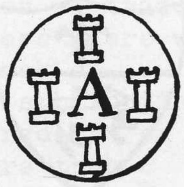
Launceston Bo.



Leicester City



Leominster Bo.

 Lincoln Co. H = Holland K = Kesteven L = Lindsey	 Liverpool City	 Liverpool City	 Liverpool City
 London City	 Macclesfield Bo.	 Maldon Bo.	 Middlesborough Bo.
 Monmouth Co.	 Newcastle-upon -Tyne City.	 Norfolk Co.	 Northumberland Co. Norwich City
 Norwich City	 Oswestry Bo.	 Peebles Co.	 Plymouth Bo.

NUMBER	DISTRICT	NOTES & MARKS
298-302	York Co. West Riding	Yorkshire was divided into three Ridings: E, W, & N.
302a, 302b	Dumbarton Co.	
303-304	York Co. W.R.	obs.
310	York Co. W.R.	
311-320	York Co. W.R.	obs.
321	Radnor Co.	
322	Hartlepool Bo.	
323	Gateshead Bo.	Said to have used a Goat's head.
324	South Shields Bo.	
325	Dumbarton Co.	obs.
326	Batley Bo.	
327	Luton Bo.	
328	Newcastle-under-Lyme Bo.	
329	Stirling Co.	
330	Peterborough Co.	
331	Crewe Bo.	
332-340	York Co. East Riding.	obs. see note for 298.
341-343	Kent Co.	
344-345	Kent Co.	obs.
346	London Co.	
347	Kent Co.	obs.
348	Kent Co.	
349	London Co.	
350	Kent Co.	obs.
351		una.
352-353	Kent Co.	obs.
354	Kent Co.	
355-356	Kent Co.	obs.
357	Kent Co.	obs.
358	Tunbridge Wells Bo.	
359	Kent Co.	obs.
360	London Co.	
361	Clackmannon Co.	
362	Stirling Burgh.	
363	Selkirk Co.	
364	Pittenweem Burgh.	obs.
365	Lostwithiel Burgh.	obs.
366	Hereford City.	
367	Oxford Co.	
368	Truro City.	
369	St.Albans City.	
370	Smethwick Bo.	
371-374		una.
375	Folkestone Bo.	
376	Great Torrington Bo.	obs.
377	Barnstaple Bo.	
378	Bridgewater Bo.	
379	Burton-on-Trent Bo.	
380	Elgin City.	
381	Glossop Bo.	
382	Gloucester City.	
383	Merioneth Co.	
384	Stockport Bo.	

NUMBER	DISTRICT	NOTES & MARKS
385	Surrey Co.	
386	London Co.	
387-388	Surrey Co.	
389-390		una.
391	Surrey Co.	
392	Carlisle City.	
393	Accrington Bo.	
394-395	Hertford Co.	obs.
396	Hertford Co.	
397-399	Hertford Co.	obs.
400-401	Leicester Co.	
402	Leicester Co.	obs.
403-407	Leicester Co.	
408-410	Gloucester Co.	
411	Gloucester Co.	obs.
412-415		una.
416	Lancaster Bo.	
417	Ashton-under-Lyne Bo.	
418	Chesterfield Bo.	obs.
419	Hertford Bo.	obs.
420	Pembroke Co.	
421		una.
422	Forfar Burgh.	
423	Kincardine Co.	
424	Oldham Bo.	
425	Marlborough Bo.	obs.
426	Berwick Co.	
427	Cambridge Bo.	
428	Montgomery Co.	
429	Pontefract Bo.	obs.
430	Rye Bo.	obs.
431	Romney Marsh Liberty.	obs.
433	Forres Burgh.	
434	Brecon Bo.	obs.
435	Warwick Bo.	
436	Haverfordwest Bo.	obs.
437	Stockton-on-Tees Bo.	
438	Dunfermline Burgh.	obs.
439	Doncaster Bo.	
440	Tiverton Bo.	
441	Flint Co.	obs.
442-444	Flint Co.	
445	Hawick Bo.	
446	Lichfield City.	obs.
447	Portsmouth Bo.	
448	Leith Burgh.	
449-452	Berkshire.	obs.
453	Berkshire.	
454	Berkshire.	obs.
455	Berkshire.	
456	Zetland.	
457	Carmarthen Co.	obs.
458-459	Carmarthen Co.	
460	Carmarthen Co.	obs.

EDITOR'S NOTE

When giving scale-maker's dates, I have found the need for an abbreviation meaning - "Earliest and Latest dates so far discovered" In other words, the dates are true and come from specific sources, such as dated scales, directories or advertisements, but they may, at any time, be extended as new evidence is found. The, often random, discovery of evidence may produce dates from obscure periods in the working life of a maker, and so the term 'flourished' would be misleading. A list of common abbreviations I intend to use in EQM, follows:-

DATES

b = born.
c = circa (about).
d = died.
el = earliest and latest dates so far discovered.
fl = flourished.

SCALES ETC..

bal = balance.
CCD = counterfeit coin detector.
CFS = cut-from-solid; a box dug out from a single block of wood.
mkr = maker.
MUB = made-up-box; a box made from seperate pieces and fixed together.
sc = scale.
wt, wts = weight, weights.

****

MARKET PLACE has been postponed because too few members have sent advertisements, and the Board are having further discussions about the type of advertisement which should be accepted. Further announcements will be made in due course.

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  George III, 20,22.
  Victoria, 19*,21,22.
  William IV, 20,21,83.
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Aeckersberg. J.W. 63.
Agate bearings, 3,7*,8.
Alderman.T.W. parcel scale, 40.
Allender. J. base coin det,13*.
  sold by Fairbanks, 78*.
Allison.R. apprenticeship, 16.
American coin sc. 14*,40,41*.
  counterfeit coin det. 12-15.
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bal.= balance: det.= detector:
mkr.= maker: mks.= marks: rev.= revue.
sc.= scale: wts. = weights.

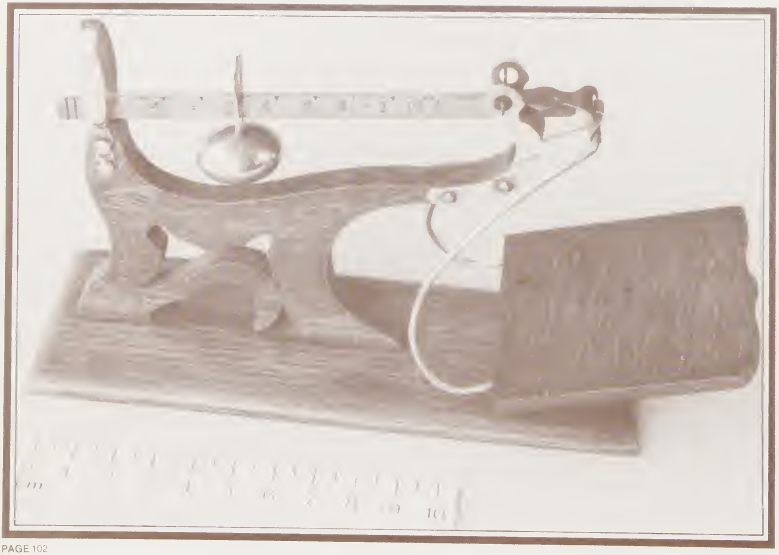
ISASC

EQUILIBRIUM

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

M.A. CRAWFORTH, EDITOR

SPRING, 1979



REVIEW

BY A.R.EACHES

UNITED STATES STANDARDS OF WEIGHTS AND MEASURES - THEIR CREATION AND CREATORS.

An interesting resume of the problems involved in the establishment of the Standard weights, and in making suitable scales for use in the early mints of the United States. The period covered is from 1789 to about 1850.

The Constitution authorized Congress to establish Standards, but the Congressmen, fearing the anger of their constituents, postponed taking action for nearly 40 years. Then, when a Standard weight was obtained from England, it was so precise that there was no scale in the mint capable of utilising it. This book follows the efforts of Joseph Saxon, and the Hasslers, in designing and making suitable scales for the mints. It appears that the Government was intent on doing the development of the scales within the establishment, although there were many commercial manufacturers making precision scales after 1830. There is no indication that the merits of their work were investigated. The booklet cites many references from the National Archives, Records of the Bureau of Mints, and of various Acts of Congress.

"United States Standards of Weights and Measures - their Creation and Creators." By Arthur H. Frazier. No. 40 in Smithsonian Studies in History and Technology, 1978. 21 pages. Available from Superintendant of Documents, U.S. Government Printing Office, Washington, DC. 20402. Stock number 003-003-01854-5. Price $ 1.00.

COVER PICTURE

This Victorian letter steelyard is most unusual, being almost entirely made from wood, with brass and steel used for wearing parts or for those requiring strength. The boxwood beam is graduated from ½ to 4 oz. x ¼ oz, and is only 133 mm. (5¼ in.) long. The brass weight is filled with lead and stamped on top, WARRANTED ACCURATE, in a circle around its hanger. The oak base is stamped near the front G.R. & Co. LONDON. The thin, black japanned steel hanger for the weight forms a rudimentary knife edge for suspension. Fig 1. See also page 112, NQ 21.

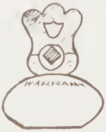


FIG 1.

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NAPIER'S BALANCES AND THE MINT

BY M.JOYCE

In the first part of the nineteenth century, David Napier had established a considerable reputation for his engineering inventiveness with advanced newspaper printing machinery, bullet-making machines, lathes, planers and other machine tools. When William Cotton, Deputy Governor of the Bank of England, wanted to develop a machine for speeding the process of sorting out gold coins that had fallen below the legal limit, which was currently done by hand-weighing, he collaborated with Napier, and in 1842 took out Patent number 9392 for such a machine. This 'Cottons' balance used a beam 225 mm. long (9 ins.), which had a standard gold coin suspended at one end, and delivered the coins to be checked, one at a time, to a small weighing platform at the other end. By an ingenious series of motions controlled by cams and slides, the coin on the platform was either pushed down one chute, if it was the correct weight, or down a reject chute, if it was too light, Fig 1. The balance could sort at the rate of 2,500 sovereigns an hour, and could detect a weight difference of 0.02 grain. The Bank of England bought three of these balances for £600, manufactured by Napier, in 1843.

In 1847, David Napier, then in his early sixties, took his son James Murdoch Napier, aged 24, into partnership in the London firm. The firm's reputation for making the finest printing machinery, of the standard required for the production of bank notes, and the connections with the Bank of England, also brought the Napier firm into contact with the Royal Mint. The Master and Deputy Master asked Napier, in 1851, if he could adapt Cotton's balance so that it could detect and reject heavy coins, as well as light ones, so that it could be employed immediately after the coins had been struck. Napier replied that he could perfect such a machine, capable of performing 30 weighings a minute, that the price for eight machines would be £1,600, and they could be delivered in six months.[1] By 1852 he had solved the complicated problems, and five were ordered for the Royal Mint, Fig 2. Apparently, there is some doubt as to who undertook the main design work involved in making these 'classifying machines', as they came to be called. Whoever helped with the design, J.M.Napier believed himself to deserve the credit, as he showed in a letter to 'The Times' on 2nd September, 1869. "The machines introduced into the Bank of England by the late Mr. Cotton, in conjunction with my father, only detected and separated the light pieces from those of sufficient weight, and are quite distinct from those employed at the Mint .... The

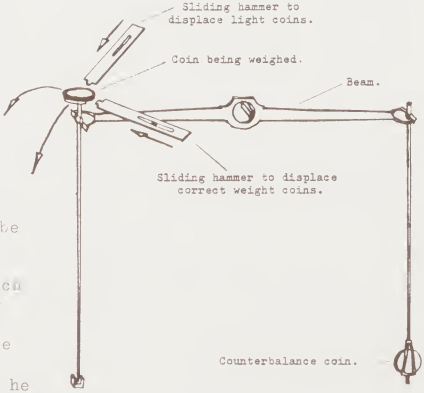
Sliding hammer to displace light coins.
Coin being weighed.
Beam.
Sliding hammer to displace correct weight coins.
Counterbalance coin.

FIG 1. Details of Cotton's balance. The light coin hammer was 0.1 inch above the level of the correct weight hammer.

complication in the mechanism, resulting in the adjustment for remedy or allowance on each side of the standard, assisted to make the problem propounded to me by Sir John Herschell and Captain Harness, Master and Deputy Master of the Mint in 1851, difficult of solution. I succeeded, after much labour, in producing the machines which have been for so many years in operation at the Mint, and, not unnaturally, desire my name to be associated with them. I am, Sir, your most obedient servant, James M.Napier, Vine St., York Rd., Lambeth, S.E. Sept. 1."

These classifying machines, and the earlier Cottons balances, were made in large numbers for banks and mints in Spain, France, South America, Russia, Japan, Germany, Australia, and India as well as United Kingdom, through the remaining years of the nineteenth century. Napier supplied the Mint with a scale model of a classifying machine, and although earlier he had given an estimate of £25 for the work, when he rendered the account in March, 1894, it was for £41.19.0. The Mint refused to pay and the account was amended to the original estimate.[1] During this period, the Mint were frequently asked by foreign mints to comment on the versatility and advantages of the machines installed at Tower Hill, and in a letter to the German Consul General in 1872, the Deputy Master, C.M.Freemantle. wrote that the machines would indicate the weight of each coin to the hundredth part of a grain. In the following year he wrote to the Stuttgart Mint, that the machines were capable of sorting at the rate of 25 coins a minute, detected a weight difference of 0.03 grain, required a floor space 2½ feet square, and stood 2¾ feet high.[1]

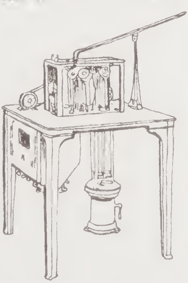

FIG 2. Napier classifying machine with hydraulic drive. Sovereigns were fed into the machine from the sloping chute. Sorted coins were removed from the box under the table top, on the left.

At the request of the Indian Mint, J.M.Napier worked on the perfection of a machine for weighing blanks before they were struck into coin, and rejecting them if they were too light. If they were the right weight, they were passed through for minting, but the major advance was that blanks that were too heavy, were automatically milled down to the correct weight. This machine might have altered minting considerably because it was capable of operating with blanks that had been cast, instead of being rolled, drawn and punched. When the Hon. Charles Fremantle heard about this, he wrote to the Secretary of the Treasury in London, that at present, 15½ % of the blanks were being rejected as too light to use, but that Napier's machine would be capable of "ensuring a degree of accuracy in the weight of the coin which has never yet been attained in any mint, and the advantage of which it is difficult to exaggerate".[1] However, Napier did not feel the invention was sufficiently perfected to be ready for widespread use, particularly since it would make rolling and punching machinery, installed in mints, redundant. In the end, the equalising machine was never supplied, even though serious interest had been shown in it by both the German Mint in Frankfurt and the Royal Mint.

During the second half of the nineteenth century, J.M.Napier worked on a series of bullion balances used for the accurate weighing of gold and silver bars. He undertook to construct one "with a beam four feet long, capable of weighing 100 lb troy to ½ grain, all the knife-edges to act upon steel planes, and to be relieved from contact after each weighing, by an apparatus which, upon the attendant turning a handle, will raise the end planes from contact". The balance was offered to the Mint for the sum of £120, and he also offered "one set of decimal weights, consisting of 26 pieces capable of weighing from 100 lb troy to 0.1 grain, and also one set of 24 pieces 50 lb to 0.1 grain" for £45.[1]

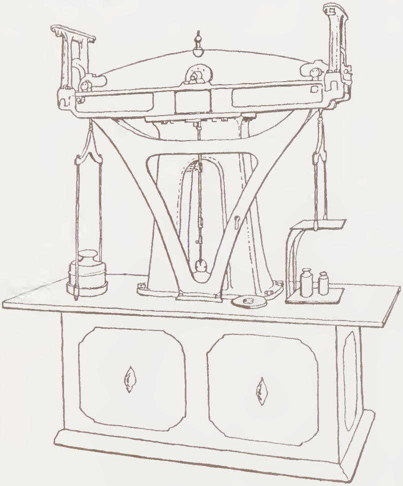

FIG 3. The "Lord High Chancellor" bullion balance made for the Bank of England, about 1884. It is now in the Royal Scottish Museum, in Edinburgh.

This correspondence took place in 1852, and the first of these balances was supplied to the Mint, although the accuracy of this first balance is quoted , elsewhere, as within two grains.[2] The Bank of England bought a bullion balance, in 1879, and called it the "Small Napier". It remained in regular use until 1975 and, by that time, it had completed about one million weighings. The enormous pressures on the steel knife edges and planes made it necessary for the knives to be rehoned, and the blocks repolished, after 10,000 weighings. The work was done by hand, and used to take one man about a week to complete. Another balance supplied by Napier, to the Bank of England, was called "The Lord High Chancellor" by Napier, and dates from about 1884 Fig 3. Other bullion balances he christened were "The Lord Chief Justice" and "The Chief Clerk".

J.M.Napier possessed a very creative mind, and took out numerous patents on his inventions including, of course, the classifying machine and the bullion balances. In his later years, he became so obsessed with the notion that people would steal his ideas, that, when he found some parts of one invention in the drawer of one of his workmen, he sacked the man on the spot, and ordered all the locks to be taken off the drawers in the workbenches. His eccentricity, and his poor commercial sense, allowed the business to decline and it eventually passed to his son Montague Stanley Napier, after his death in 1895.

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[1] Royal Mint records. Public Record Office, Kew, Surrey.

[2] Wilson.C.H. & W.J.Reader. 'Men and Machines.' Weidenfeld & Nicholson, London 1958.

PROFILE - FAIRBANKS & CO. PART 2

SENT IN BY M.S.NEEDLE

Fairbank's scales found a ready market, and the company soon added new designs to their repertoire. By 1858, there were ten different types of scales listed in their catalogue, ranging from small counter scales to railroad weighbridges. But it was the original designs of Thaddeus Fairbanks that had the greatest influence upon all scale building in the world ever since the first patent was granted. Consider, for example, the construction of the familiar portable platform scale which can be seen today in almost every store and factory. There was nothing like it on the American market before Fairbank's invention. Nearly every scale factory making this type of portable scale in the country, has embodied his design, and no substantial changes in general appearance were made for over one hundred years.

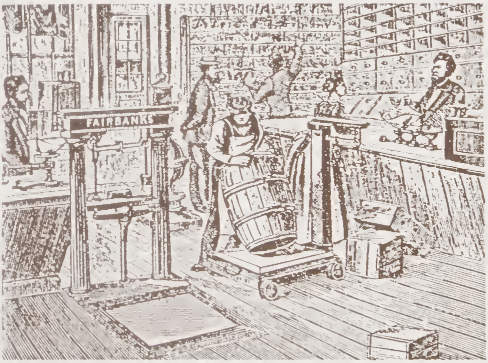

FIG 1. *A wood engraving shows a number of low-capacity scales designed by Thaddeus Fairbanks for the needs of the small merchant.*

A similar influence was exerted by the 'straight lever' railroad track scale, over a century old. With one exception, all companies now manufacturing these scales have copied the general arrangement of the original Fairbanks design.

The shop in which the scales were first made was a wooden building 25 by 60 feet with 1500 square feet of floor space. It was the factory, warehouse and salesroom combined. After a few years a third brother, Joseph P. Fairbanks, gave up his law practice to enter the scale business with his older brothers, Erastus and Thaddeus, and the firm was named E. & T. Fairbanks and Co.

➢

Official recognition of the superiority of Fairbank's scales began in 1834 with the award of a silver medal from the American Institute of New York City. This was the first medal awarded by this noted scientific society. Nearly a century later the same society renewed its recognition of the merits of Fairbanks scales by giving its honorary degree of fellowship to the then head of E.& T. Fairbanks and Co., Mr. Percy C. Brooks of New York. In the years following 1834, Fairbanks scales won honours in all parts of the globe. Since the Great Exhibition in London in 1851, Fairbanks scales received the highest awards at every successive international exposition.

Perhaps even more satisfying than these official prizes are some of the unsolicited testimonials which have been received through the years, to the value of the St. Johnsbury product. Among these is one that was sent to E. & T. Fairbanks and Co. in 1852, signed by nearly a score of the merchants and manufacturers of Baltimore:- "The undersigned take pleasure in recommending Fairbanks scales, having used them for several years, and have always found them to work correctly, and regard them as the most desirable, accurate and convenient scales in use." Outstanding among the signatories was John Hopkins, noted Baltimore merchant and founder of the great university and also of the hospital that bears his honoured name.

In 1874, E. & T. Fairbanks and Co. was awarded the contract for 3,000 postal scales for the United States Government - the largest contract of its kind which had ever been made, up to that time. Seven firms bid for the contract, but Fairbanks was the only firm that could furnish the scales in the specified time of eight days. The Government sent its experts to St. Johnsbury to inspect the scales and attend to their mailing to all parts of the United States. In commenting on this episode, the New York World declared: "The contractors have abundant facilities for meeting their engagement and it is a great relief to know that, for once at least, the government will be sure to get its money's worth." One offshoot of this contract was the official adoption in 1875, of the Fairbanks scale by the Japanese post office department.

At international exhibitions the Fairbanks scale continued to outdistance all competitors. At the Centennial Exposition at Philadelphia, in 1876, the Company's exhibit occupied 2,664 square feet in Machinery Hall, with 198 complete scales of various patterns, a huge testing machine, and many scale accessories. There was also a supplementary exhibit of scales in Agricultural Hall for weighing livestock, grain, butter and cheese. At that time, nearly one third of the output of the factory was exported, graduated for the kilograms of France, the horas of Spain, the skalpunds of Sweden, the poods of Russia, the okas of Turkey, the pfunds of Germany, the punds of Denmark and the catties of China. At the Paris Exposition, in 1878, Fairbanks scales were awarded three gold medals, two silver and two bronze medals - more medals than were awarded to any other exhibitor at this great world's fair.

Towards the end of the 19th century, the range of Fairbanks scales changed, with greater concentration on warehouse, factory and trader's scales. In 1891, their catalogue contained none of the coin detectors, prescription, chemists, druggists, bankers, jewellers, tobacco, silver scales or spring balances, that had been present in 1859. The only small scales illustrated were postal scales. In 1902, their catalogue included small scales for letters, coins, grain testing and prescriptions, all of the steelyard type, but the emphasis was still on the larger commercial machines. A selection from the 1891 catalogue is shown in Fig. 2. ⊳

****

FIG 2. E. & T. FAIRBANKS & CO. CATALOGUE 1891 (opposite).

1. Boston market scales, with iron crane. Pans 15 or 18 inches diam., and made of tin, copper, or porcelain. Capacities 50, 100 or 125 lb. Prices $ 15 to $ 27.
2. Grocer's even balance trip scales, with tin or brass funnel scoop. Capacities 2,6,10, or 16 lb. $ 5.50 to $ 14.00.
3. Glass blower's scale. $\frac{1}{4}$ oz. to 2 lb. $ 8.
4. Butcher's meat beam, iron and nickel-plated brass. Capacity of main beam 1,000 lb., side beam 100 lb., $ 50. or 500 lb. and 5 lb., $ 45.
5. Counter butter scales with 10 inch square porcelain plate. Capacity $\frac{1}{2}$ oz. to 22 lb. $ 10.50.
6. Druggist's scales with tin or brass scoop. Capacity 1oz. to 8 lb. Prices $ 10 or $11.
7. Platform scales with wood pillar and brass sliding poise. Platform size 13 x 16 inches, capacity 2 oz. to 300 lb. $ 22.
8. Express package scale. Platform 10$\frac{1}{2}$ x 12 inches. Capacity 1 oz. to 55 lb. Price $ 15.
9. Boston market scales with double beam and iron crane. Pan 15 or 18 inches diam., and made of tin, copper, or porcelain. Capacities 50, 100 or 125 lb. Prices $ 17 to $ 29.
10. Dormant warehouse scales, with wood pillar, drop lever, and notched beam. Capacities 1,500; 2,000; 2,500; 3,500; or 5,000 lb. Platform sizes from 25 x 31 inches to 45 x 48 inches. $ 68 to $ 150.
11. Even balance postal scales with wood base and brass weights. Capacity $\frac{1}{4}$ oz. to 8 oz. Brass $ 5. or nickel plated $ 6.
12. Portable platform scales for weighing pig iron. Capacity 2,500 or 3,000 lb. Platform size 25 x 37 inches. $ 110 or $ 120.

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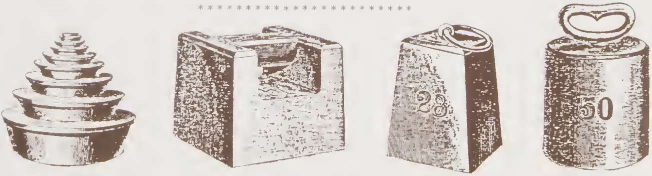

FIG 3. The only weights offered in 1891 : 1. 'Nest' weights in iron, zinc or brass. sets up to 8oz, 1,2,4,or 8lb: 2. U.S. Standard Test Weight, cast iron 50lb. only: 3. Ring weights, iron $\frac{1}{2}$ to 50 lb: 4. Handle weights, iron $\frac{1}{2}$ to 50 lb.

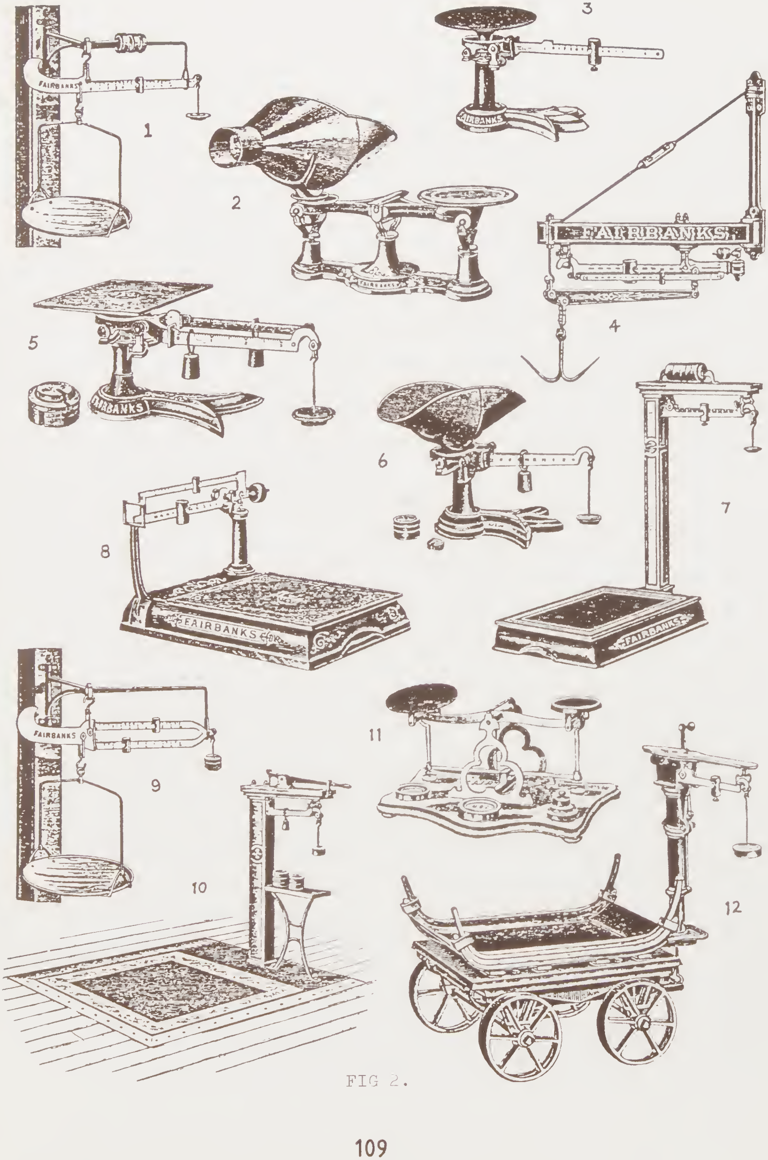
1
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FIG 2.

AMERICAN PATENTS BY MEMBERS OF THE FAIRBANKS FAMILY

1831	Jun.13.	*	E.& T.	Fairbanks.	Wg.Mc. for heavy bodies.
1832	Feb.21.	*	T.& E.	"	Weighing heavy bodies.
1832	Sep.22.	*	T.	"	Steelyard balance.
1834	Mar. 6.	*	E.& T.	"	Weighing heavy bodies. (1).
1834	Mar. 6.	*	E.& T.	"	Weighing heavy bodies. (2).
1837	Feb.10.	+ 118	E.& T.	"	Weighing machine.
1837	Feb.10.	+ 119	E.& T.	"	Weighing machine.
1837	Feb.10.	+ 120	E.& T.	"	Steelyard balance.
1837	Feb.10.	+ 121	E.& T.	"	Steelyard balance.
1837	Feb.10.	+ 122	E.& T.	"	Weighing machine.
1837	Feb.10.	+ 123	E.& T.	"	Weighing machine.
1837	Feb.10.	+ 124	E.& T.	"	Weighing machine.
1846	Sep.15.	4767	T.	"	Steelyard.
1849	Mar.13.	6109	T.	"	Balance, double scale.
1849	Nov.20.	6895	T.	"	Platform scale.
1857	Jan.13.	16381	T.	"	Platform scale.
1859	Nov. 1.	25962	T.	"	Railroad platform scale.
1859	Nov. 8.	26026	T.	"	Letter scale.
1859	Dec.20.	26494	T.	"	Platform scale.
1859	Dec.20.	26486	T.	"	Platform scale.
1862	Feb.18.	34419	T.	"	Platform scale.
1862	Mar.18.	34698	T.	"	Platform scale.
1868	Sep.29.	82619	T.& H.	"	Scales, charging.
1869	Jul.13.	92430	**H.	"	Auto grain weighing.
1869	Dec.28.	98363	H.	"	Milling knife edges for Wg.Mc.
1870	May.10.	102792	T.	"	Scales.
1870	Sep.13.	107239	H.	"	Scales, self-registering.
1870	Sep.13.	107240	H.	"	Scales, recording weight.
1871	Jan.17.	110965	H.	"	Wg.Mc. electro-magnetic.
1874	Feb.14.	111733	T. Fairbanks and H. Paddock.		Scales.

* Patents issued before the Patent Office fire in December 1836.

+ Re-issues of patents destroyed in the fire. Numbering started in 1836.

** Erastus Fairbanks had a son called Horace, and Thaddeus had a son named Henry.

CONTEMPORARY COMMENT

To the Mechanical Constructor
Mr. Thaddeus Fairbanks,
Well Born:

His Imperial Royal Apostolic Majesty, hath, by His Most Sovereign Letters of the 27th of October, 1873, most graciously conferred upon Mr. Thaddeus Fairbanks, Mechanical Constructor, the Knightly Cross of the Imperial Order of Francis Joseph. The Chancery of the Order has the honour to enclose the appropriate decoration.

Baron von Lichtenfels,
Chancellor of the Order,
Vienna, Austria, 1873.

FAIRBANKS. May the power which is mightily in the universe keep him and guard him, and grant him all happiness and prosperity.

Somditch Phra Paramindr Maha
Chululoukom, Phra Chulu Chom
Keas, 5th Sovereign of Siam.

Praise to God alone !
From the servant of God
May his name be glorified
Who relies on Him
And leaves to Him
All his earthly affairs.

Mohammed as Sadok Pasha Bey
Possessor of the Kingdom of Tunis.

Inventor and Maker
Of the Fairbanks scale
In compliance with the request
Of our Prime Minister and
Minister of Foreign Affairs
And on Account of the merits
Which distinguish you.

We send you this decoration
Ornamented with our Name
And which is of the Second Class
Commander of OUR ORDER IFTAKAR.

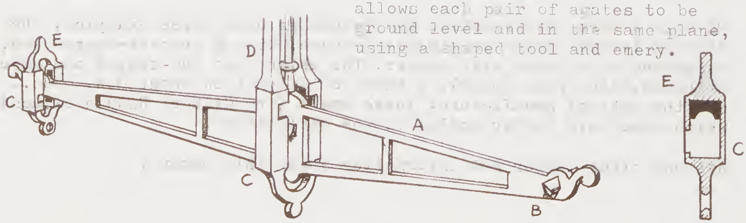
May you wear it in peace and
Prosperity !

Written the 7th Babia
Elawel 1294, Kheradine,
Prime Minister of Foreign
affairs.

PATENTLY INTERESTING

BRITISH PATENT No. 214. Jan 24th, 1857, P.H.Sharkey of Liverpool.

The beam A is in one piece and has three pippin-shaped, cast steel knife edges B. They work in semi-circular bushes made of steel, agate or hard stone, held in boxes C formed in the suspension shears D and scale pan suspenders E. Improved by Sharkey in Patent No. 284, Feb 2nd, 1871. A removable cover on each box allows each pair of agates to be ground level and in the same plane, using a shaped tool and emery.

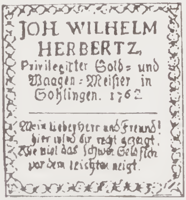


NOTES & QUERIES

NQ 19. JOHAN WILHELM HERBERTZ

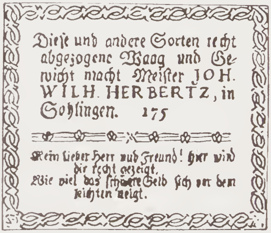
Note from C.Mönnig.

With reference to The Scale in Question, EQM p53, I have been searching for months for some evidence, and I have now discovered two sets of scales and weights by Johan Wilhelm Herbertz, in a Cologne collection. They were made in Solingen, and one is dated 175_ , and the other 1762. A translation of the text is :- " My Dear Sir, and Friend, here will be shown to you how much a heavy coin dips before a light one".



JOH WILHELM
HERBERTZ,
Privilegirter Gold= und
Waagen=Meiſter in
Sohlingen. 1762

Mein lieber Herr und Freund!
hier wird dir recht gezeigt,
Wie viel das ſchwere Geld ſich
vor dem leichten neigt.



Dieſe und andere Sorten recht
abgezogene Waag und Ge-
wicht macht Meiſter JOH.
WILH. HERBERTZ, in
Sohlingen. 175

Mein lieber Herr und Freund! Hier wird
dir recht gezeigt.
Wie viel das ſchwere Geld ſich vor dem
leichten neigt.

NQ 20. WOODEN POSTAL SCALE.

query from D.G.Vorley.

Although I rarely buy scales these days, I could not resist the little wooden beam balance I saw recently at an antique fair, even though it is not complete. It is almost entirely of wood (oak) except for the pivot end of the beam, to which is rivetted a pierced piece of metal from which, presumably, the article to be weighed was suspended. The only other part which is metal, is the pivot, of very light construction and not made for frequent hard work. The beam is notched in ounces, and along which a weight was suspended (missing) and moved in the usual manner. On top of the base is stamped the maker's mark G.R. & Co. LONDON.

Can you please tell me anything about this particular scale, especially the period of manufacture, identity of the maker, and what sort of weight was used and if there is something missing, like a clip to which letters, or whatever was to be weighed, were attached ?

REPLY

from the Editor.

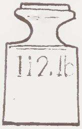
This is a rare letter scale, and I know of only three examples. The missing letter plate was a wooden square, with a bracket-shaped end, suspended by a brass wire hanger. The weight was bun-shaped and made of brass,(See front cover). I have no information about G.R. & Co., nor the date of manufacture. There was a firm Gilbert Riddle of London, which made/sold letter scales in the early 1840s.

Has any other member got information about this maker ?

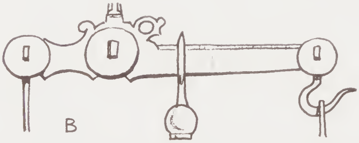
NQ 21. YOUNG & SON PERSON SCALE. note from M.A.Crawforth.

I recently obtained a person scale by Young & Son of London, which is identical to the one described by Brian Brass, (page 18). When it was stripped down for cleaning, I found it was marked underneath the seat, in manuscript, "Leather. T.A. No. 105. 30/4/84" The seat is, in fact, upholstered with maroon leather, and I assume it was Young's 105th person scale, and that it was made by a craftsman with the initials T.A., in the year 1884.

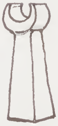
There is a full set of proportional weights marked 8,8,4,2, & 1 stone. They are also marked 112,112,56,28 & 14 lb respectively. The weights are made of brass, well hollowed-out, and filled with lead. Their actual weight shows the 'power', or proportional ratio, to be 56 to 1, (i.e. the 4 stone, 56 lb weight, actually weighs 1 lb). The steelyard is graduated from 0 to 14 lb x $\frac{1}{4}$ lb, making the total capacity 24 stone.



A



B



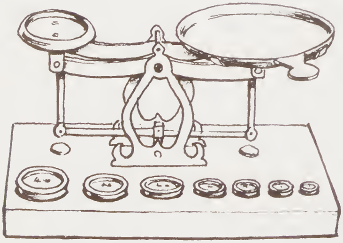
C

The beam and its supporting column are all brass, and the design is unusual in having three box bearings. The centre knife rests in a single concave bearing at the top of the column, C.

NQ 22. PHOTOGRAPHIC SCALES query from A.Jackson.

I have a scale which looks like a letter scale, but one of the pans is removable and has a small handle. Can you tell me what it was used for, and when it was made ?

REPLY from the Editor.



Your scale is of the Roberval type commonly used for letters, but the removable pan shows that it was for weighing chemicals for photographic purposes, in the days when every photographer made up his own solutions. The weights were usually in Avoir ounces and drams.

Such scales appeared in catalogues in the first two decades of the 20th century, and were often nickel-plated for extra resistance to corrosion.

ERRATUM EQM p62, line 4. The maker's name should be Johann Peter Braselmann, and not Johann Petrus Braselmann, as shown. Apologies to Carl Mönnig. - Editor.

CONTEMPORARY COMMENT (see page 103)

"Mr. Cotton's machine seems, by general consent, to be deemed the most delicate ever yet constructed for weighing gold coin. Its precision is, indeed, most exquisite. If ever a 'well-balanced judgement' could be an attribute of steel and brass, we have it here: a child can turn the handle, but the machine judges for itself."

"In the transactions between the Bank of England and the public, the weighing of gold coin has been a most anxious and tedious process." "Mr. Cotton was led to the conception of his beautiful machine by observing the injustice which the Bank sometimes unconsciously inflicted on its customers. Sovereigns which were issued from one counter at the Bank as being of full weight, were refused at another counter as being light. The scales may not have been equally delicate, or the liability to error on the part of the weighers, ... may not have been exactly equal. An expert weigher could weigh about 700 sovereigns in an hour by the old balance; ..."

"Mr. Cotton, having determined on the plan of a machine which should be quicker, easier, and more exact than the ordinary gold balance, procured the services of Mr. Napier to put his views into a practical form; and the result is entirely satisfactory. The machine is a pretty, delicate, light affair - much more so than those hitherto noticed. There is, in the first place, a small vertical tube, in which a pile of twenty or thirty sovereigns is placed, in single column. The lowermost sovereign rests upon a moveable plate; when a handle is turned by the attendant, the plate moves sideways, and the sovereign is brought upon an exquisitely sensitive balance; if the weight is correct, a little lever, arm or pusher, gives the edge of the sovereign a smart impulse, and drives it off into a box; but if the weight be deficient, even in the most minute degree, another pusher attacks the sovereign on a different side, and drives it into another box. As the handle is continued in motion, two or three sovereigns may be in different stages of the weighing process at one time."

"On a rough average, 30,000 sovereigns pass over the Bank counter every day; each machine can weigh 10,000 sovereigns in six hours; and there are six machines..." "Between 1844 and 1848, there were forty-eight million gold coins weighed by these machines at the Bank..." "Each machine requires an hour's cleaning once a week; ...and they are said to be peculiarly free from liability to disarrangement."

From The Banker's Magazine. London 1851.

ADDENDUM - Money Scales from the Dukedom of Berg and County of Mark.

Page 64. Add the following references : (from the author).

Böhmer. Dr. E. Schwelm, Die Goldwaage in Der Märker 3, 1954, pages 28 to 30.
Lavagne. F.A. Maîtres balanciers de la région Rhénane. In Schweizer Münzblätter, Jgg21. 1971, Heft 83, p 76 - 84.

BRITISH VERIFICATION MARKS

PART 5

BY M.A.CRAWFORTH

In concluding this series of articles, it seems appropriate to look at the instruments and tools used by inspectors in the verification of scales and weights. An outdoor balance has already been illustrated on page 91, and in use, it would have been suspended from a large folding tripod, made of wood (ash) or iron, and standing about five feet high (1.5m). This decorative and prestigious beam was made in 1892, by Thomas Cheshire, in the high style of the 18th century.

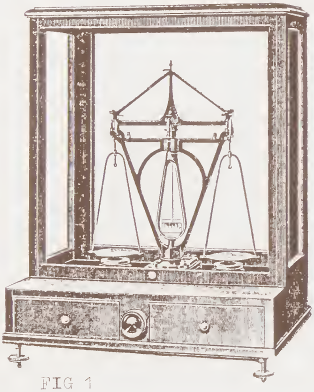


FIG 1

Only five years later, W.& T. Avery Ltd. were offering newly designed balances, of severely functional appearance, in their "Catalogue for Inspectors of Weights and Measures", dated 1897. Their balances were made to conform to the new Board of Trade Regulations of 1895, which required the use of continuous knife edges. The beams were made of gun-metal (a form of bronze, 88% copper, 10% tin, and 2% zinc), and the design made it impossible for the inspector to assemble it with the end bearings transposed, thereby eliminating possible variations in performance. A beam of this type is shown in Fig 3, No. 2, and it was intended for the same outdoor use as Thomas Cheshire's beam. Indoors, however, weighing was done with balances in glass cases to minimise the accumulation of dust, and to eliminate draughts, Fig 1.

The weights offered by Averys' in 1897 were also of a new design, approved by the "Committee of Inspectors and Manufacturers Appointed to report on the working of the Weights and Measures Acts of 1878 and 1889". Most of the weights were available made from gun-metal, hard brass, or phosphor-bronze (an alloy of approximately 90% copper, 9% tin, and 1% phosphorus). Included in the catalogue, were various sets of cylindrical knobbed weights in small mahogany boxes. They were marked in grains, drachms, or Troy ounces, and each set included tweezers and minute wire weights down to 0.01 grain. A separate set of platinum and aluminium wire weights, 10 to 0.01 grain, was offered, in a round screw top box made of ebony or ivory. Each wire weight was bent to a shape which symbolised its denomination. Fig 2.

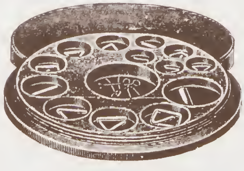


FIG 2.

The Regulations required weights and balances to be kept in 'proper boxes', ➢

and the Standards had to be stored in a "press", or cupboard, 7ft. 6in. high, with glass doors facing the verification room. The minimum size for an inspector's office was given as 500 square feet, and whether permanent or temporary, the office had to be free from vibrations and was not to be on premises where intoxicating liquor was sold !

Each inspector had to be provided with an outdoor inspection kit of weights, balances and tools. Where more than one inspector was working in the same district, their verification punches had to have a distinguishing number, or other mark. The punches were permitted to be of the "cutting" type, which made incuse marks, or of the die-sunk type, which produced an embossed design. To prevent improper use of the punches, they had to be locked up when not in use, and worn-out ones had to be defaced. The inspector's kit included such items as specially shaped anvils, a drilling machine, a portable furnace, a lead plug mould, and many other items, all available in Avery's catalogue.

This catalogue, published by W. & T. Avery Ltd. in 1897, was handsomely bound in red, with gold decoration and lettering and gilt-edged pages. It illustrated twenty-five balances, twelve sets of weights, thirty-one tools and appliances, and many measures of length and capacity. All the balances, weights and measures were verified by the Board of Trade, with the mark shown on page 91. A selection from this impressive 19th C. publication is shown in Figs 1 to 5.

The quality of these Avery products is an indication of the high standards achieved in mechanical methods of weighing during the 1880s and following decades. Today, however, the mechanical has given way to the electronic, and inspectors must tolerate the lower accuracy demanded of digital read-out shop scales - a disappointment after the achievements of eighty years ago.

****

???? HAVE YOU CHECKED THE MARKS ON YOUR SCALES AND WEIGHTS ????

If you have any British verification marks which have not been shown in EQM, please send details to the author, along with any other information which may help to identify them. They will be published in EQM later.

FIG 3. INSPECTOR'S SCALES FROM AVERY'S CATALOGUE, 1897.

1. Pocket balance. 6 inch gun-metal beam. Rising pillar. Mahogany or leather case. Capacity 1 oz.
2. Outdoor balance for verification of weights up to 56 lb. 24 inch gun-metal beam. Brass or copper pans.
3. Outdoor balance in an oak case $21\frac{1}{2}$ x 17 x $6\frac{1}{2}$ inches, with spirit levels. Capacity 7 lb. Standard weights $\frac{1}{2}$ dram to 8 oz, and set of bell weights from 1 to 7 lb.
4. Indoor balance for verification of weights up to 1 oz. 6 inch gun-metal beam. Brass or copper pans. Brass lever pillar, wood base.
5. Indoor balance for verification of Troy weights up to 500 oz, or Avoir. weights up to 56 lb. With all knife edges on polished steel planes, and improved arrestment gear.

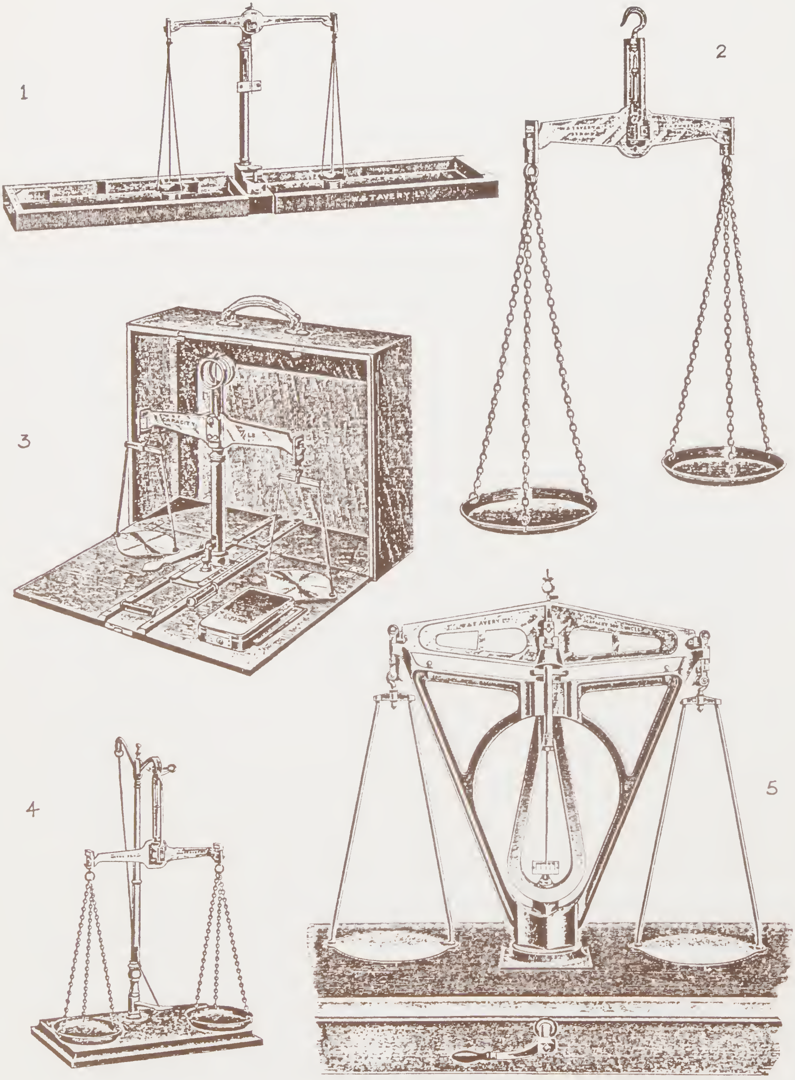


FIG 3.

FIG 4. INSPECTOR'S WEIGHTS FROM AVERY'S CATALOGUE, 1897.

1. Cylindrical pattern Standard Avoir weights ½ dram to 56 lb. Gun-metal, phosphor-bronze or hard brass. Metric also available.
2. 'T'-handle pattern Standard Avoir weights, ½ dram to 56 lb. Gun-metal, phosphor-bronze or hard brass.
3. Standard iron Bar weights, 1 to 56 lb. with corners rounded-off to prevent wear or chipping. The Regulations state that for testing weighing machines, ecery inspector should have at least one ton of 56 lb weights as working standards.
4. Weight for testing steelyards, 56 lb, with wrought iron handle.
5. Spherical, or Globe pattern, Standard Avoir weights, ½ dram to 56 lb. Fitted in strong iron-bound hardwood boxes lined with cloth or baize.
6. Bell shaped Standard Avoir weights, ½ dram to 56 lb. Gun-metal, phosphor-bronze or hard brass. (N.B. below 1 lb. the weights are of the flat rimmed pattern. Ed.)
7. Globe weights, as in 5., were available without boxes, and the other patterns were available with boxes.

FIG 5. INSPECTOR'S TOOLS FROM AVERY'S CATALOGUE, 1897. (see page 120).

1. Verification pliers with dies engraved with Crown, V.R. and the district number. Used for impressing lead plugs on small beams, etc.
2. Lead mould for making rods 1/8, 1/4, 3/8 and 1/2 inch in diameter, for plugging weights or scale beams.
3. Patent undercutting drills for the plugging and adjusting of brass or iron weights. The tapered hole so made, behaved like a dovetail and prevented the plug falling out, once it had been hammered in. Sizes 1/4, 1/2, 3/4 and 1 1/8 inch, undercutting to 5/16, 5/8, 7/8 and 1 5/16 inch diameter, respectively.
4. Bench drilling machine, self-acting pattern, with capacity for two speeds, and up to 1 ¼ inch diameter.
5. Improved portable forge, with tray size 22 x 33 inch or 26 x 38inch.
6. Portable stamping anvil for measures, cup weights etc.
7. Verification punches, 1/8, 1/4, 1/2, 3/4 and 1 inch diameter. Engraved with Crown, V.R. and the district number, or with any special design, as required.
8. Stamping block for weights, japanned iron, with a tapered slot to take the handles of bell and ring weights, with the weights upside down, during the process of plugging and stamping. Flat weights were placed face downwards on the circular bosses.

****

At the time Avery's catalogue was published, the firm had recently taken over the Soho Foundry, home of the world famous engineering business of James Watt & Co., pioneers of the steam engine. (Soho Foundry was the first building to have gas lighting installed, in 1798.)

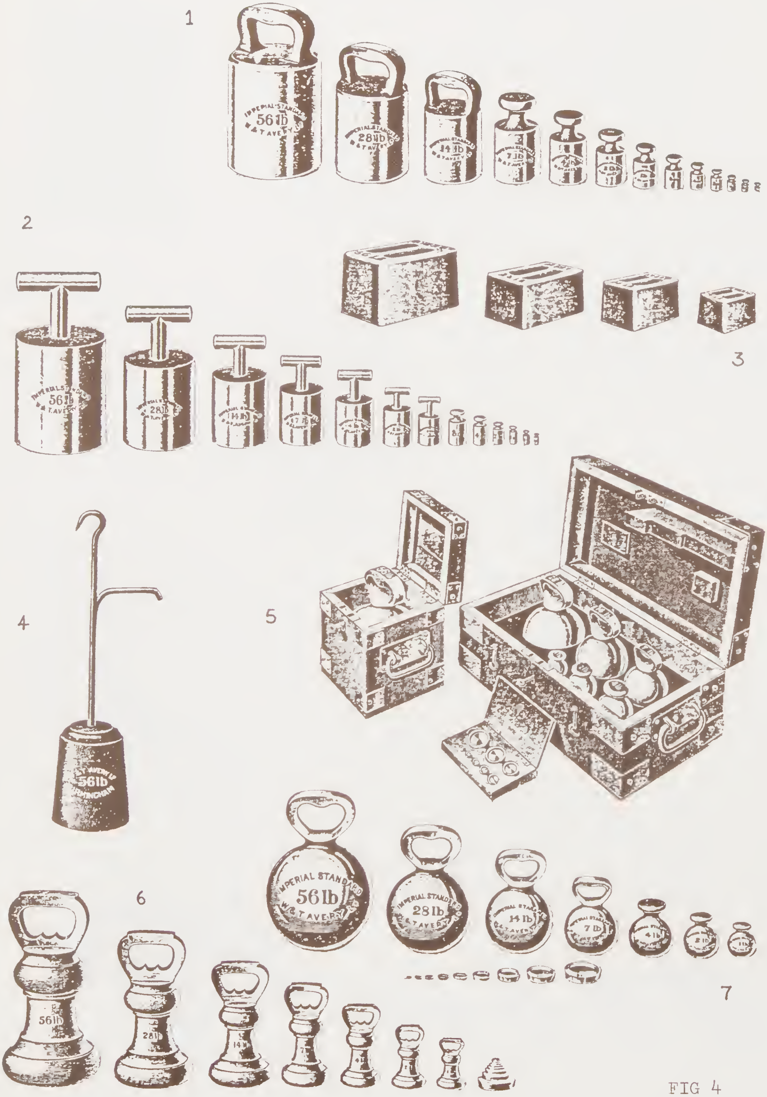

1
IMPERIAL STANDARD
56 lb
W & T AVERY
28 lb
14 lb
7 lb
2
56 lb
28 lb
14 lb
7 lb
3
4
56 lb
BIRMINGHAM
5
6
56 lb
28 lb
14 lb
7
IMPERIAL STANDARD
56 lb
W & T AVERY
28 lb
14 lb
7 lb
4 lb
2 lb
1 lb

FIG 4

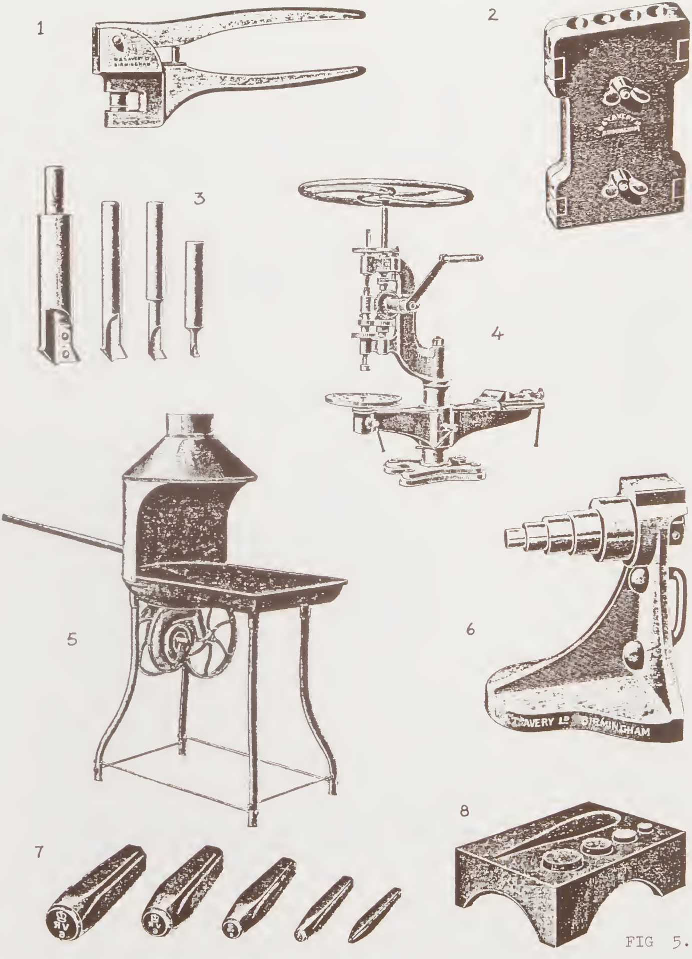
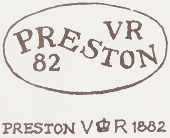
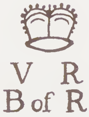


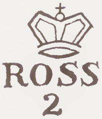
FIG 5.



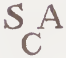
Preston Bo.



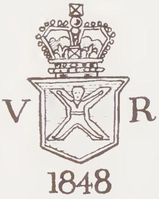
Rochdale Bo.



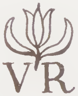
Ross Co.
1 = Tain
2 = Dingwall
3 = Stornoway



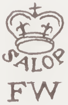
St. Albans City



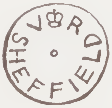
St. Andrews Bo.



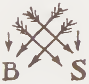
Saffron Walden Bo.



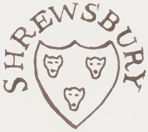
Salop Co.



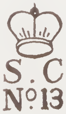
Sheffield City



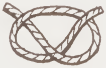
Sheffield City



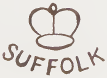
Shrewsbury Bo.



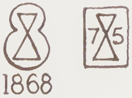
Somerset Co.



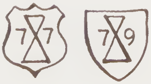
Stafford Co.



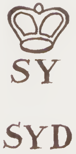
Suffolk Co.



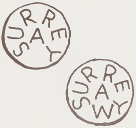
Sunderland Bo.
number = date.
Different shape
for each year.



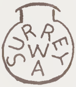
Sunderland Bo.



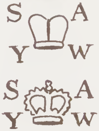
Surrey Co.



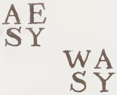
Surrey Co.



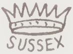
Surrey Co.



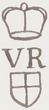
Surrey Co.



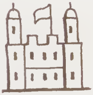
Surrey Co.



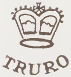
Sussex Co.
after 1834



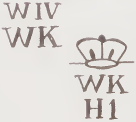
Tewkesbury Bo.



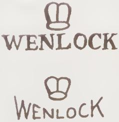
Tower of
London.



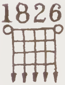
Truro City



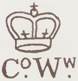
Warwick Bo.



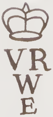
Wenlock Bo.



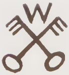
Westminster City



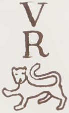
Wicklow Co.
(Ireland)



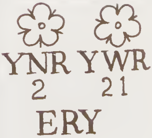
Wiltshire Co.



Wisbech Bo.



York Bo.



York Co.
North Riding.
West Riding.
East Riding.

CORRECTION: Page 94. Norfolk Co. should read Northumberland Co. and Northumberland Co. should read Norwich City.

NUMBER	DISTRICT	NOTES & MARKS
461	Essex Co.	obs.
462	New Romney Bo.	obs.
463	Ripon City	obs.
464	Wiltshire Co	
465	Caithness Co.	Ill.
466	Maidenhead Bo.	obs.
467	Rotherham Bo.	
468	Ayr Burgh	Ill.
469	Suffolk, East	obs. Ill.
470	Morley Bo.	
471	Hamilton Burgh	
472	Bacup Bo.	
473	Dunbar Burgh	
474 - 476	Warwick Co.	
477	Burnley Bo.	
478	St. Helen's Bo.	
479	Midlothian Co.	
480	West Ham Bo.	
481	Neath Bo.	
482	Surrey Co.	obs. Ill.
483	Croyden Bo.	
484	Hertford Co.	Ill.
485	Hanley Bo.	
486	Peterborough City	
487	Dundee Burgh	Ill.
488	Arbroath Burgh	Ill.
489		una.
490	Bristol City	Ill.
491	Macclesfield Bo.	Ill.
492	Congleton Bo.	Ill.
493 - 494	Nottingham Co.	Ill.
495	Preston Bo.	Ill.
496	Middlesbrough Bo.	Ill.
497 - 499	Denbigh Co.	Ill.
500	Rochdale Bo.	Ill.
501 - 506	Northumberland Co.	Ill.
507	Rochester Bo.	
508	Essex Co.	obs.
509 - 510	Essex Co.	
511	Winchester City	
512 - 513	Monmouth Co.	Ill.
514	Kendall Bo.	
515 - 517	Carnarvon Co.	Ill.
518 - 519	Carnarvon Co.	obs.
520	Isle of Wight Co.	
521	Dudley Bo.	
522 - 524	London Co.	
and 524	Dumbarton Bo.	
525 - 526	Northampton Co.	
527	York Co. East Riding.	Ill.
528 - 529	Lincoln Co.	Ill.
530	Leamington Bo.	
531	Rutland Co.	
532	Grimsby Bo.	Ill.
533	Rathmines Township (Co. Dublin).	
534	Worcester Co.	
535 - 536	Aberdeen Co.	
537	Aberdeen Co.	obs.
538	Peebles Co.	Ill.

NUMBER	DISTRICT	NOTES & MARKS
539 - 544		una.
545	York City	
546	Kirkaldy Burgh	
547	Banbury Bo.	
548	Ryde Bo. Isle of Wight	
549	Guildford Bo.	
550 - 552	Norfolk Co.	Ill.
553	Blackpool Bo.	
554	Haddington Co.	Ill.
555	Airdrie Bo.	Ill.
556	Shrewsbury Bo.	Ill.
557	Haddington Burgh	
558	Lincoln Co.	Parts of New Holland. Ill.
559 - 561	Southampton Co.	i.e. Hampshire. Ill.
562	Bury Bo.	
563	Monmouth Co.	Ill.
564	Inverness Burgh	
565	Cambridge Co.	Ill.
566	Argyll Co.	Ill.
567 S or N	Salop Co.	South or North. Ill.
568	Ross & Cromarty Co.	Ill.
569	Dover Bo.	Ill.
570 - 571	Cardigan Co.	Ill.
572	Reigate Bo.	
573	Folkestone Bo.	obs.
574	Wiltshire Co.	Ill.
575 - 576	Somerset Co.	Ill.
577	Somerset Co.	obs.
578		una.
579	Portsmouth Bo	obs.
580	Gravesend Bo.	Ill.
581	Campbeltown Burgh	Ill.
582	Bournemouth Bo	
583	Devon Co.	obs. Ill.
584 - 588	Devon Co.	
589	Middlesex Co.	
590	Wakefield City	
591	Halifax Bo.	
592	Dewsbury Bo.	
593	Wigtown Co.	
594	Falkirk Burgh	Ill.
595	Wigtown Burgh	
596	Fraserburgh Burgh	obs.
597	West Hartlepool Bo.	
598	Hyde Bo.	
599 - 600	Essex Co.	
601 - 610		una.
611	Kingstown Township (Co. Dublin)	
612	Ballsbridge Township (Co. Dublin)	
613		una.
614	North Berwick Burgh	
615	Dublin City	Ill.
616 - 619		una.
620	Carmarthen Bo.	
621	Peebles Co. and Bo.	Ill.
622	Durham City	Ill.
623		una.
624	York Co. East Riding	Ill.
625	Northampton Bo.	
626	Dundee Burgh.	Ill.

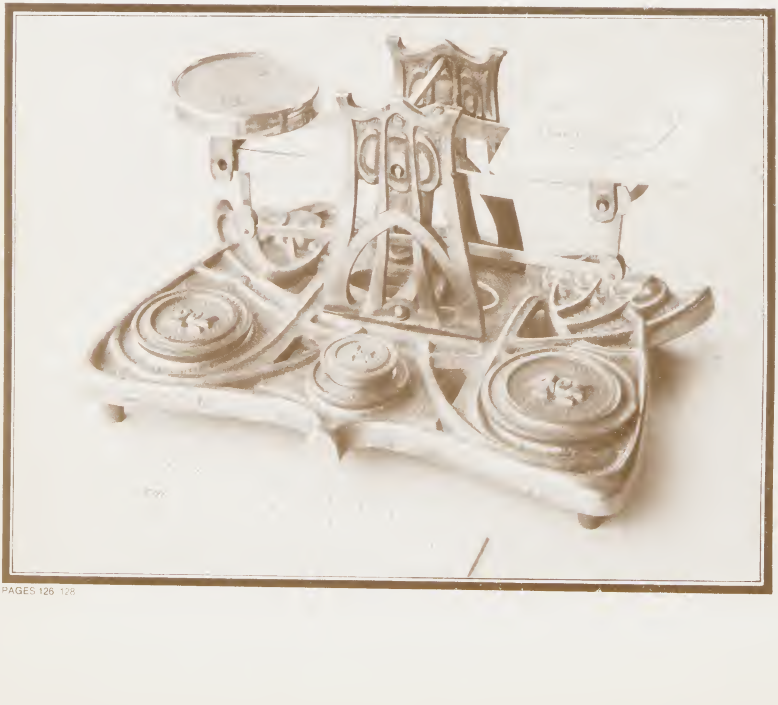
ISASC

EQUILIBRIUM

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

M.A. CRAWFORTH, EDITOR

SUMMER, 1979



PAGES 126 128

EDITOR'S COMMENT

The Editor and his wife were invited to give lectures at the recent International Symposium held in conjunction with an important auction of scales and weights, in San Francisco. We were invited to many ISASC homes, and had a superlative time learning about American scales, and seeing many unusual variations among the 3000+ which we examined. San Francisco is a very beautiful town, but our most treasured memories are of peoples' incredible kindness and generosity, and the considerate way they allowed us to examine and photograph their scales. We will never forget the thrill of finding a signed ladder scale among Ruth Willard's fantastically varied collection; the fun of gambling while being weighed on a person scale in Herr Chandler's collection; Russell Steven's extraordinary grape lug scale; the excitement of finding scales by Samuel Gatchell in the collection of Fritz Schmerl; superb large trade scales and pretty postals in Bob Robert's collection; and the stunningly wonderful collection of Bill Doniger, which holds so many delights and surprises.

The symposium itself was a wonderful opportunity to meet ISASC members and discuss scales in depth. The lectures were most informative, and it is hoped to publish them in forthcoming issues of EQM,(The first one is in this issue). The whole occasion was most rewarding and we hope that similar events can be organised for the benefit of other ISASC members.

Our congratulations go to Bill Doniger for organising a smoothly running Symposium, and our heartfelt thanks to Bill, Joel and Dick for making our trip possible.

COVER PICTURE

The lively decoration of this Roberval scale is strongly Art Nouveau in style. It was made between 1908 and 1915, as deduced from the postage rates which were current from 1897 to 1915 and the Registered number 540716, marked under the base, which was taken out in 1908. Brass was used for the scales and 'A' frames, but the weights and base were made from cast iron and plated with brass. Similar scales and Art Nouveau frames were also mounted on a plain wood base.

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

Bob Stein, Chairman — 20 North Wacker Drive, Chicago, IL, 60606 U.S.A.
Michael Crawforth, Vice Chairman — 31 Park Lea, Sunderland SR3 3TA England
Albert Eaches, Vice Chairman/Treasurer — R.D.3, Box 241, Phoenixville, PA 19460 U.S.A.

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Symposium '79

PAPER PRESENTED
BY M.A.CRAWFORTH

ROBERVAL

RELEVANCE OF ROBERVAL'S STATIC ENIGMA TO ENGLISH SCALES OF THE 19th C.

In 1669, a mathematician called Gilles Personne de Roberval, demonstrated a mechanical curiosity to his colleagues at a meeting of French scientists and philosophers. Roberval's apparatus comprised two equal-arm beams, pivoted one above the other, and connected at their extremities by pivoted T shaped members, Fig 1. He showed the assembled scientists that weights of equal mass could be placed on the horizontal bars, at any unequal distance from the main fulcrum, yet, contrary to their expectations, the system remained in equilibrium. The assembly was confounded ! Even the best brains of the day were unable to give a satisfactory explanation, and the apparatus became known as Roberval's Static Enigma.

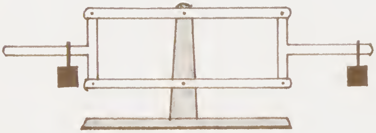

FIG 1.

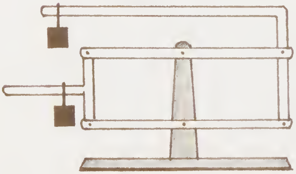

FIG 2.

Roberval's colleagues were, of course, thoroughly familiar with the traditional equal-arm beam scale, for which it is essential to have the weights at exactly equal distances from the fulcrum to attain equilibrium. So, they were even more astounded, later, when Roberval produced his modified apparatus in which one T member was extended and bent back over the main fulcrum. With this system, equilibrium was still maintained even when both weights were on the same side of the fulcrum, Fig 2.

It was characteristic of the period that no practical application of the idea was envisaged, or even sought, and scientists were content to let it remain an intellectual conundrum for well over a century. The Apparatus appeared in eighteenth century encyclopaedias and other works, solely as a mechanical curiosity, and it was not until 1804, that the seeming paradox was fully explained by Professor L.Poinsot in his Elements de Statique.

The explanation depends upon the principles of mechanical moments and couples, whereby the eccentric effects of the weights are considered as vertical and rotational forces. The unequal rotational forces caused by the different distances of the weights from the beam end pivots are cancelled out as tension and compression forces along the beams, Fig 3.

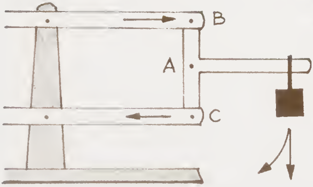

FIG 3.

Consider the eccentric force of the weight trying to rotste the T member around point A. Then the movement of the member at B is trying to elongate the top beam, and at C it is trying to compress the bottom beam. When acting in these directions, they can have no effect on the equilibrium of the system, providing it is based on true parallelograms. In consequence, only the vertical forces remain - the weight of the weights - to act upon the balance of the beam. The only points at which the vertical forces can act are the beam end pivots, which are equidistant from the main fulcrum, and which are subject to the normal laws of equal-arm beams.

This freedom to place the weight (or a load) anywhere on the T member proved to be of immense importance in the design of scales. New possibilities arose because, not only were the eccentric forces cancelled out, but the shape of the T members was not important. In fact, they could be replaced by other members of any shape, and the member at one end could be different from the member at the other end, providing they were of equal weight.

Scalemakers developed the idea that the members could be extended upwards to support pans ABOVE the beam, and the horizontal bar omitted. The lower beam was also replaced by light stays, and this arrangement became the most common form of Roberval scales, Fig 4. In America, the design became known as a 'stabilised pan scale'.

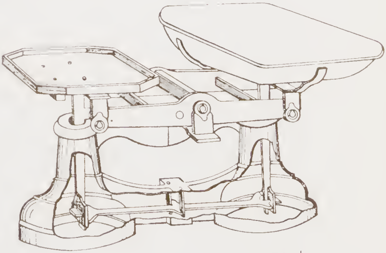

FIG 4.

By eliminating the hampering cords, or chains, of traditional scales, the new design permitted the weighing of a wide range of loads of different sizes and shapes. It was also more compact and more robust than its predecessors. Such new-found convenience was a boon to shopkeepers, coal merchants and traders of all kinds, see Figs 4 & 5. It brought convenience, too, to many offices and homes in the form of the common letter scales which were made in a great variety of size and decorative style, Figs 7,8 and Cover Picture. In England the use of Roberval scales became widespread, from about 1830, for over a century, and they are still in use on market stalls today. Several variations of small Robervals were developed in the 1930's for grading eggs on poultry farms, Fig 9.

Manufacturers soon discovered, however, that the great convenience of Roberval scales could not be achieved without some disadvantages. Several sources of error are inherent in the design, which are not found in traditional equal-arm beam scales with hanging pans. Any deviation from parallelism due to faulty manufacture, or to subsequent damage or wear, causes inaccurate weighing. The beam and the stays must be truly parallel and equal in length. Similarly, the vertical members, the 'legs', must be parallel to, and equal in length to, the central support and main fulcra. A difference of 0.8mm (1/32") in the length of a leg would produce a weighing error in excess of that allowed by the Weights and Measures regulations. Friction is a greater problem in the Roberval system, due to the extra pivots required for the stays. In addition, the rotational forces which so conveniently cancel out with respect to equilibrium, are nevertheless, still present, and they result in undesirable effects. They tend to drag the bearings across the knife edges, causing wear, and if any free play exists in the stay pivots the forces result in an effective change in length of the stay, and the essential parallelism is lost.

All these problems were recognised in the Board of Trade regulations which allowed errors for the Roberval type of scale, which were five times as great as the allowance for hanging pan scales of equivalent capacity. Nevertheless, Roberval scales were accurate enough for most retail trade purposes.

The troublesome rotational forces remain a problem of the Roberval system. There were various attempts at improvement and some alternative solutions, such as the more complicated Beranger and Phanzeder systems. One of the simpler improvements appears to have been an early development. The rotational forces were reduced by making the legs as long as possible. To avoid making the scales inconveniently high for counter use, the legs were replaced by upward projecting pillars with stays at the top, connected to a central column. Thus very long legs were obtained while keeping the weight and load pans low, Figs 10 and 11. This design was known as the Inverted Roberval, or Imperial Scale, but the convenience of unimpeded access was partly lost. Larger versions were made for weighing such things as sacks of coal, flour, bales and other large goods, Fig 12.

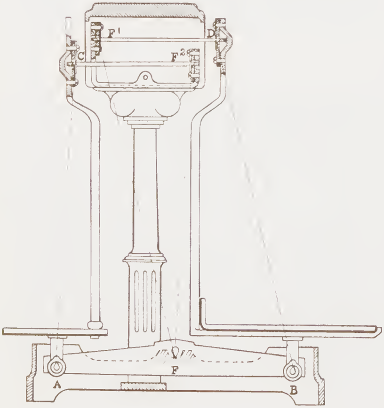

FIG 11.

The versatility of the Roberval system was not confined to a symmetrical arrangement of two parallelograms. For example, it was possible to have a Roberval linkage on one side of the beam, and a hanging pan on the other side, as seen in a parcel scale made by S.Mordan & Co. of London, Fig 13. Alternatively, the hanging pan and loose weights could be dispensed with, and be replaced by any type of resistant to counterbalance the load. Various examples are shown in Figs 14 to 17. They are described as Half-Roberval and Steelyard, Half-Roberval and weight lifting beam, Half-Roberval and Pendulum, Half-Roberval and spring, and so on. Letter scales were made in all these variations, but only a few types were satisfactory for trade purposes.

It will be seen that the version with a spring resistant has been further modified. Instead of attaching a spring to the other end of the beam, it was connected to the bottom stay of the half-Roberval link. This had the same result, mechanically, as far as weighing was concerned, but, by omitting half the beam a simpler and more compact design was achieved. A screw at the top attachment of the spring, permitted adjustment of the zero indication.

The undoubted success of Roberval scales for general trade use, and for domestic letter scales, is a great credit to the inventor, and leads one to ask where, when and by whom, was the Roberval scale invented ? Written histories of weighing provide no direct answers to these questions. Haeberle deduces that the invention was English, because the Roberval scale was not in common use in France until the middle of the nineteenth century, at which time the French called it an "English Scale". However, in England, it was sometimes called a "French Scale", possibly in deference to Roberval's nationality !

➢

KEY TO THE FIGURES ON PAGE 131

Fig 5. Confectioner's scales; removable scoop, single beam, cast iron base. Max. capacity 1 lb. Length of base 250mm.($9\frac{3}{4}$in) Late 19th C.

Fig 6. 'Dead-weight' coal scales; folding back rail; capacity 3cwt; Sack plate 380 x 460mm.(15 x 18 in.) W.& T.Avery Ltd, 1897.

Fig 7. Letter scales by S.Mordan & Co. London. Ornate pierced brasswork is also engraved with palm trees, exotic birds and floral design. Weights 8P, 4P, 2P, 1P, F,F, Length of base 239mm. (9in.). Note that twin beams were commonly used on Roberval scales for extra stability.

Fig 8. Traveller's letter scales; folding flaps on the letter plate; square weights 4,2,1,$\frac{1}{2}$ oz. contained in a compartment below the scales. Length of box 140mm. ($5\frac{1}{2}$ in.) S.Mordan & Co. c.1890.

Fig 9. Egg scales; cast iron with spun aluminium cups. c.1935. Weights 2,1,$\frac{1}{2}$,$\frac{1}{4}$oz. 2dr. Length of base 145mm. ($5\frac{3}{4}$in.).

Fig 10. Imperial scales for butchers, grocers etc. Inverted Roberval, capacity 28 lb; goods plate 280 x 330mm. (11 x 13in.) Avery 1924.

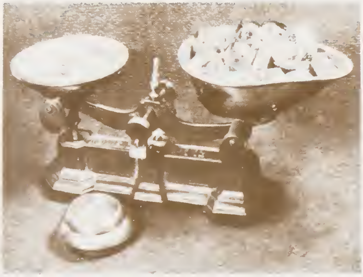

FIG 5

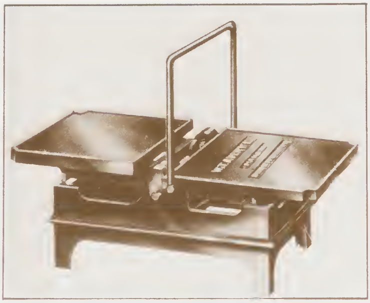

FIG 6

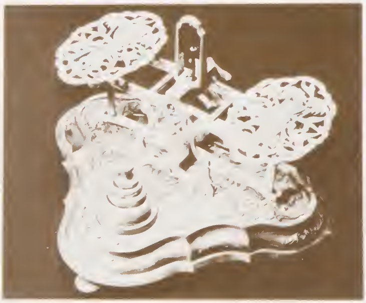

FIG 7

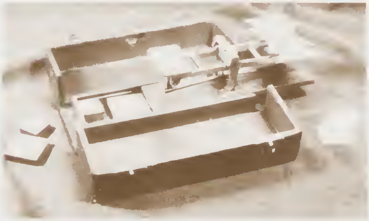

FIG 8

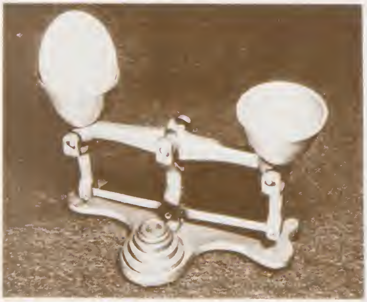

FIG 9

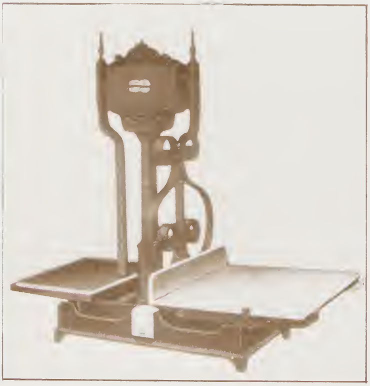

FIG 10

In my research, I have found three relevant pieces of evidence. Firstly, the Encyclopaedia Britannica for 1783 illustrated all the contemporary types of scales being manufactured, and yet, it did not show the Roberval scale. Only the Static Enigma was included, as a curiosity, in the section on mechanics. Therefor, there is a strong probability that the invention had not been made at that time. Secondly, there were several advertisements in trade directories for 1828, in which both Roberval and Inverted Roberval scales were illustrated. None of them indicate that the design was new or unusual. In other words, this type of scale had been in use for some years, and trade users were familiar with it. One example, by Bourne & Smith of Birmingham, states that their scales are "Improved patent counter scales", which suggests that they had already had an earlier design,(see Old Advert). In spite of their own claim, there was no British patent for the Roberval scales. However, it was not unusual to claim patents in advertisements of the nineteenth century, when no patent existed, or where the patent was for some minor aspect.

In an advertisement from a Manchester trade directory, also of 1828, Radfords & Waddington illustrated scales only of the Roberval and Inverted Roberval type, with their comment that they "..can with confidence, after many years experience, recommend their improved portable weighing machines as superior to any other sort." Of the five scales shown, one was a Roberval shop scale, one was an Inverted Roberval

---

KEY TO THE FIGURES ON PAGE 133

Fig 12. Dead-weight coal scales; Inverted Roberval with wheels and barrow handles. Large weights were placed on the bottom wood plate, smaller weights were kept on the top of the column and transferred to the top plates as required. Capacity 4 cwt. Each plate 460 x 560mm. (18 x 22in.) W.& T. Avery Ltd. 1897.

Fig 13. Parcel scales by S.Mordan & Co. London. Half-Roberval and hanging pan. Postage rates 1871 - 85, Registered No. for 1883. Weights 4,4lb,16,8,4,2,1,½,½oz. Length of base 380mm. (15in.).

Fig 14. Letter scale. Half-Roberval and steelyard; telescopic weight slides out of the hollow decorated beam. Graduations ½ to 8oz. Postage rates for 1871 - 97. Length of base 200 mm. (8in.)

Fig 15. Letter scale by Jos.& Edmd. Ratcliff, Birmingham. Half-Roberval and weight-lifting beam, patented by R.Willis in 1840. Price, but not weight, is indicated. Length of marble base 250mm.(10in).

Fig 16. Letter balance; Half-Roberval and pendulum. Postage rates for 1871 - 97. Brass with wooden base; Height 185mm. (7¼in.)

Fig 17. Left: Egg balance by M.M.& S. Ltd. Black painted case and nickel plated cup and base, c.1935. Height 100mm. (4in.). Right: Letter balance 'Criterion'. All brass with open sides. Both examples are Half- Roberval and spring types.

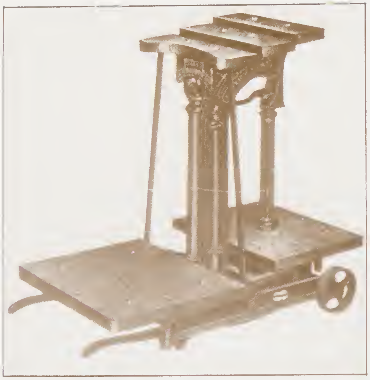

FIG 12

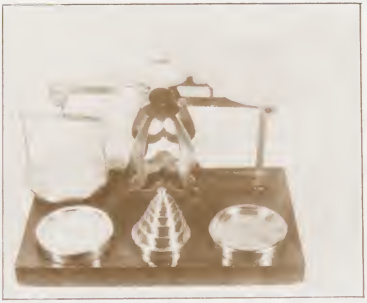

FIG 13

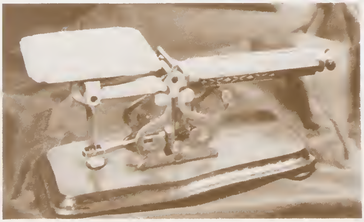

FIG 14

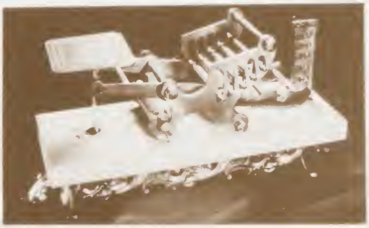

FIG 15

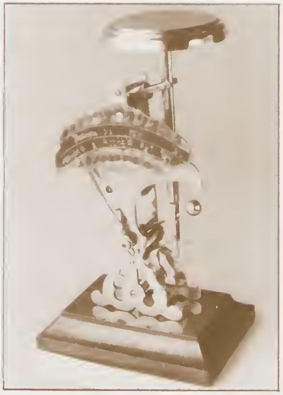

FIG 16

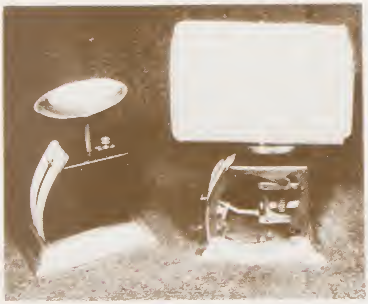

FIG 17

counter scale, two were inverted sack scales and one was a flat sack scale. It appears from the evidence of advertisements, and from the encyclopaedia, that the Roberval scale was invented later than 1783, but some years before 1826.

Finally, I found some indication of who might have made the invention. In his patent for a weight lifting letter scale of 1840, Fig 15, Robert Willis illustrated a half Roberval linkage, and specified that the letter plate should be above the beam "..with a link below, in the manner of the common Medhurst pan", and again, in another part of the patent, he describes it as the type "..usually denominated a Medhurst pan." This reference was made, probably, less than forty years after the invention of the Roberval scale, and well within living memory of the event.

In trade directories and patent records, I traced a man called George Medhurst, of 1 Denmark Street, Soho, London, who was working in the right period. He was a scalemaker, an engineer and a prolific inventor with patents for a condensing wind engine in 1799, a horseless carriage in 1800, a compound steam circular-to-linear motion mechanism in 1801, a [illegible] machine in 1801, and a hydraulic balance in [illegible]. Although the last patent includes no referance to a Robervel system (and it would not have been appropriate to his design), George Medhurst is, obviously, a suitable candidate for the inventor of what we now call Roberval scales.

Willis' use of the name Medhurst pan, also raises the question of whether the inventor had ever heard of Roberval's Static Enigma ? Did he, in fact, make an entirely independent invention which was given the name of Roberval, in the late nineteenth century, by scientists and authors of technical treatises on weighing machines ?

Whoever the inventor was, we should acknowledge the debt we owe him for these rugged and practical scales which added a whole new spectrum to the field of weighing machines. Regrettably, the origins remain undiscovered, and in this respect, the Roberval is still an enigma.

* * * * * * * * * * * * * * * * * * *

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REVIEW

from Antiques & Art Monitor. June. 1979.

WEIGHING COINS: ENGLISH FOLDING GOLD BALANCES OF THE 18TH AND 19TH C.

Book by Michael Crawforth.

Most dealers and scale collectors know what a folding coin scale is; they are slim,neat little gadgets that weighed golden guineas or sovereigns and then slipped back into a gentleman's coat pocket. They date back to 1775 but still turn up from time to time, particularly in the North-west where most of them were made.

If you have seen a few and consider yourself familiar with them, you will be dismayed to know that there are over 150 different recorded types - with or without weights, cases made of mahogany, brass, ivory, tortoiseshell, or miniatures that go down to 3 inches in length, apart from any stylistic differences which vary from maker to maker.

Now there is a whole book devoted to them. It is beautifully produced and is illustrated by the author's own drawings. Rather fortunately, he has a degree in industrial design and in the foreword he points out that an accurate drawing can show more detail than a photograph, however good that photograph may be.

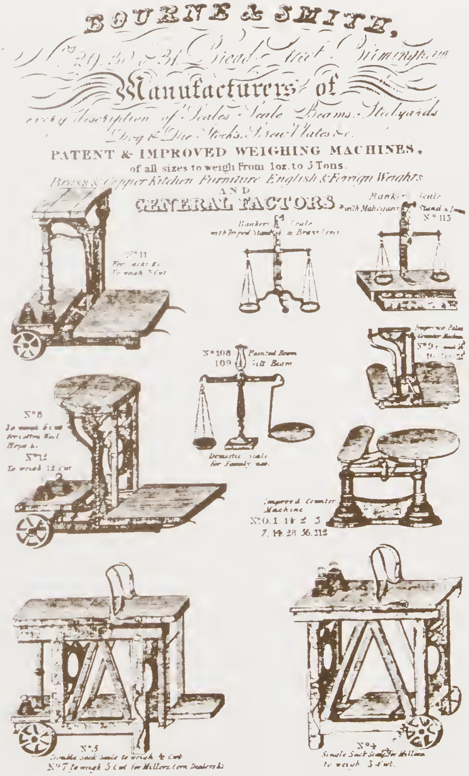
Michael Crawforth shows great scholarship and attention to detail in writing what is the standard reference work on the subject. It is now possible to identify the maker and date most 'folders' simply from the design and construction aspect, despite the fact that the maker's label may have fallen out and become lost - a common enough fault.

Weighing Coins; English Folding Gold Balances of the 18th and 19th C. by Michael A. Crawforth is available from Cape Horn Trading Ltd. 12 New Row, Covent Garden, London WC2 5LF. First edition with leather spine and autographed by the author, in a limited edition of 50 copies, Price £20. Second edition in standard hardback, Price £15. Post and packing in the U.K. £0.75, Europe £1.00, elsewhere £3.00.

Published under the auspices of I.S.A.S.C., the book was first launched at the International Symposium held in San Francisco in April 1979.

OLD ADVERT.

FROM WRIGHTSON'S DIRECTORY OF BIRMINGHAM 1828.



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Nos. 29, 30 & 31 Bread Street, Birmingham

Manufacturers of

every description of Scales, Scale Beams, Steelyards

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PATENT & IMPROVED WEIGHING MACHINES,

of all sizes to weigh From 1oz. to 5 Tons.

Brass & Copper Kitchen Furniture English & Foreign Weights

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GENERAL FACTORS.

Bankers Scale with Mahogany Stand & Iron
N° 115
Bankers Scale with Japd Standard & Brass Lever
N° 11 For Sacks &c To weigh 3 Cwt
N° 108 Painted Beam
109 Gilt Beam
Domestic Scale for Family use.
Improved Patent Counter Machine
N° 9
N° 8 To weigh 6 cwt for cotton Wool Hops &c.
N° 12 To weigh 12 Cwt
Improved Counter Machine
N° 0. 1. 1½ 2 3
7. 14. 28 56. 112
N° 5 Double Sack Scale to weigh 4 Cwt
N° 7 to weigh 5 Cwt for Millers, Corn Dealers &c
N° 4 Single Sack Scale for Millers to weigh 3 cwt.

REPAIRING SUGAR SCALES

BY J.LOUND.

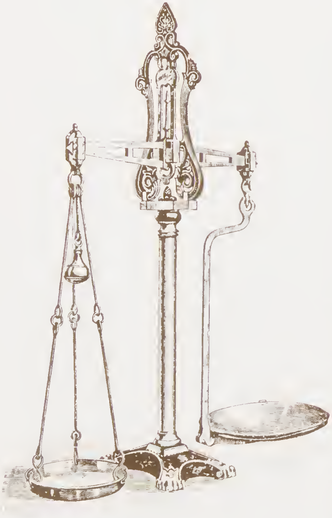

FIG 1.

Before the last war, most grocer's shops had, in their complement of weighing equipment, one or two beams scales used specifically for sugar weighing, Fig 1. Either 7 lb. or 10 lb. in capacity, they were used in the back of the shop or warehouse, where they were subjected to considerable abuse, in addition to normal hard wear. This led to quite a lot of rejections by the Weights and Measures inspector. On his annual or bi-annual visit to shops he would test the beams, allowing an error of up to 12 grains on a 7 lb, beam, but, if this allowance was exceeded,the trade verification stamp was immediately obliterated by a star. This meant that the scale had to be repaired and re-stamped before it could go back into the shop for trade use.

Many of these scales found their way into our workshops for repair, and as all scale repairs at that period had to be done in a specific time - three and a half hours were allowed for a 7 lb. beam - it was a matter of "sleeves up and get on with it". Six knife edges on three centres, six agate bearings and six friction plates[1] were the parts required for a full repair. Old centres were knocked out and pippin steel[2],slightly oversize, was selected from the rack and new knives filed up and fitted rigidly into the beam, taking care that they were perfectly horizontal and square across the beam. The gauge[3] was made perfect and the amount of face[4] or top weight corrected. The amount of play between friction plates and knife was usually determined before the old agates and frictions were removed, and then the new centres were polished and hardened. With pippin steel, no potash or hardening compound was necessary - just heating to a bright cherry red and a vertical immersion in clean cold water. The vertical immersion was essential, otherwise bending or cracking could occur - then it was 'start all over again'.

Old agates, usually with vents[5] worn in them, were removed by applying a gentle heat to the agate boxes and gallows to soften the cement and the friction plates were removed at the same time, Fig 2. Replacement agates were then taken from the stores and checked very carefully to see that they compared with the old ones for size. Friction plates were filed up, polished and chamfered before hardening and, again with gentle heat, the new parts were inserted and fixed in place with agate cement. Some old 'Scalies' would insist on making their own agate cement - a 'witches brew' containing pitch and various other ingredients, and like a lot of other things in the trade, the recipe was a closely guarded secret. The idea was that it should not be too brittle when cold, allowing the bearing to work loose, but should be tough and resilient when holding the agate and friction plate in place.

When both agate boxes and the gallows were set up, a final touch was to warm them and hang the beam. This was to ensure that the bearings settled and touched all along the knife edge. A last check was on the play - as little as possible but giving free movement - and our beam was ready for testing.

The correct way was to assemble and balance the scale and then apply test weights to the full load, i.e. 3 lb. on each end. If the scale appeared to be lighter at one end than the other, this was known as a 'short end' and had to be corrected. Beam sets⁶ were used to peen out the brass and lengthen the short end until it was the same as its partner. All old hands knew another trick, and giving the beam a tap or two on the jaw of the vise, with the pivot upright, could rectify most errors and add or subtract a little power where necessary.

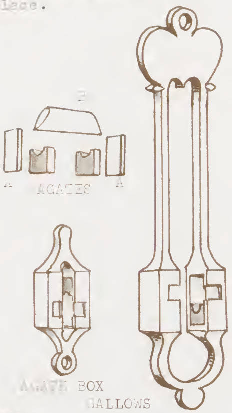

FIG 2.

Final adjustments were made and the scale was put down ready for stamping, but other jobs were still to be done - probably by the apprentice - worn links to replace on the chains, split pans to solder and maybe a new balance ball⁷ to fit. Buffing, cleaning and repainting had to be done, the beam being left alone in case of distortion. Finally, the cast foot and 'lamp top' were stripped and repainted and then redecorated with gold leaf powder mixed in goldsize...... Hope we get a good inspector !

****

1. Friction plates - hard steel plates at the end of bearings, designed to take the end thrust of the knife edge, Fig 2 A.
2. Pippin steel - a special section of steel bar used for making knife edges, so called because its shape is like an apple pip or pippin. Fig 2 B.
3. Gauge - the distance between the knife edges.
4. Face - the horizontal alignment of the knife edges.
5. Vents - grooves worn by the repeated action of the knife edge.
6. Beam sets - large flat-ended punches.
7. Balance ball - a pear-shaped container holding lead shot, Fig 1.

John Lound trained as a service adjuster and scale repairer. He is now the Area Manager for a scale sales and service organisation.
(My apologies for getting this wrong last time - Editor).

REVIEW

VETERAN SCALES AND BALANCES

By Brian Jewell.

This book is an extraordinary mixture of extremes: Good text - atrocious sketches; good photographs - bad photographs; useful directory of makers - dates not researched; interesting illustrations from old manuscripts - boringly similar scales on successive pages; accurate statements - glaring mistakes.

The author is a professional writer on hobby subjects, and not a specialist on scales. He has drawn heavily on the excellent booklet 'A Short History of Weighing' by L.Sanders, to which he has added a few miscellaneous features from other sources.(Why didn't he also read the books by Bruno Kisch and Sheppard & Musham, both currently in print ?). The result is rather like a scrap-book, and regrettably, he used some photographs of incomplete scales, good examples of which are readily available.

There is a useful glossary of common terms and a directory of scale maker's names with dates. Unfortunately, the author appears to have had access only to trade directories of the 1820's, and a list of 18th century instrument makers. Dates only from the 1820's are misleading in the case of several firms who were in business for up to a century or more.

There are also some glaring errors. For example, a late 19th century folding sovereign balance is shown with the coin plate and hanger back to front, and is described as an 18th century guinea balance by Wilkinson - the label clearly shows the name W.& T.Avery, Makers, Birmingham. The author also credits Wilkinson with two 19th century scales of a type he never made, in a century in which he didn't live ! Egg balances are described as being only of the pendulum type, and postal balances are described as being only of the pendulum, Roberval or spring type (no steelyards, no bismars, no hydraulic, no rocker, no equal-arm beam scale, and so on !). A standard English chondrometer is shown with its beam on one side, and under the heading of Pyknometers and Hydrometers.

Do not be put off by these criticisms - they had to be stated. Mr. Jewell's book has an excellent text (thanks to Mr. Sanders) and many of the illustrations and much of the data is useful. The history of scales is dealt with briefly but thoroughly, covering all the main types from coin scales to weighbridges. The book is good value for money, lavishly illustrated and provides a good background for the subject.

Veteran Scales and Balances, by Brian Jewell, is obtainable from the publishers, Midas Books, 12 Dene Way, Speldhurst, Tunbridge Wells, Kent, TN3 ONX, England. Price £3.50 (hardback) plus postage for 425 grams (15 oz).

SPACE-AGE WEIGHING

BY M. GASSER

It may be hard to imagine, but almost all structures which we think of as rigid, are flexible to some extent. So, any load applied to a structure will cause it to bend, and the higher the load, the greater the bending. By measuring this distortion, a form of weighing device can be made.

As the distortion of a near-rigid structure is very small, a special measuring device is used, called a strain gauge, Fig 1. This is a wire element with an electrical resistance which varies according to the distortion, or stress, applied to it. Thus measuring the passage of an electrical current through the gauge, indicates the degree of distortion it is being subjected to.

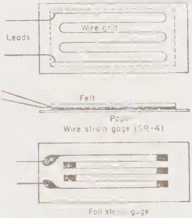

FIG 1.

The strain gauge is bonded to the structure so that, when the structure bends, the gauge is forced to distort too. Using this system, measurements down to one-millionth of an inch per inch are possible.

If known weights are applied to the structure, the measurement of strain can be calibrated in units of weight, and the device becomes a weighing instrument.

When an aircraft is to be weighed, a scale incorporating a strain gauge is placed under each wheel, and the overall weight is derived from the sum of all the readings. Weighing is a necessary part of ensuring that the aircraft will become airborne (Aeroplanes that won't get off the ground are very embarrassing !).

Spacecraft too, must be very close to the designed weight, neither too light nor too heavy, because the rocket motors have a fixed amount of thrust and are designed to place the spacecraft in a specific orbit. The International Ultraviolet Explorer (IUE), shown in Fig 2. is a combined project of the U.K., ESRO and NASA. It was weighed, to ± 1 lb., by hanging it from a calibrated strain gauge assembly, known as a load cell. The total weight was about 1500 lb., and the calibration was a graph of known weights plotted against electrical resistance.

In addition to the overall weight specification, the IUE spacecraft had a strict balance requirement. For this measurement, two load cells were used, one on each cross axis of a balance table, Fig 3. The spacecraft is shown resting on the static balance table in Fig 2, where the hydrazine fuel is being loaded into six spherical tanks, while the strict requirement for an evenly balanced distribution is monitored.

Once achieved, the balance must be maintained throughout the lifetime of the spacecraft, to ensure accurate control and maintenance of the desired orbit.

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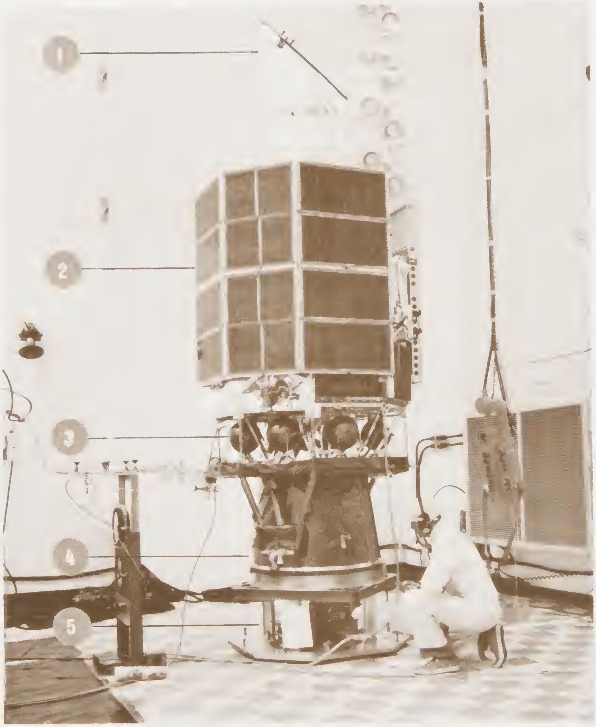
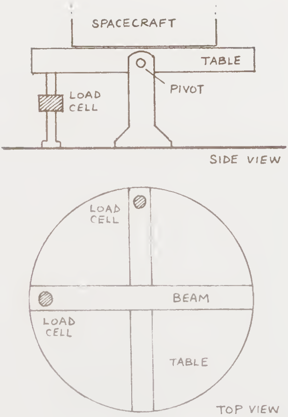


FIG 2. International Ultraviolet Explorer.

The spacecraft is shown mounted on a static balance table at the Kennedy Space Centre at Cape Canaveral, Florida. A technician is checking the balance as the craft is being loaded with Hydrazine fuel. He is dressed in clean-room uniform.

1. Telescope through which objects in space are observed. The pictures are transmitted back to Earth.
2. Solar panels generate electric power when in space orbit. They are shown folded against the craft for launching.
3. Spherical tanks for the Hydrazine fuel.
4. Hydrazine rocket engines position the spacecraft in orbit.
5. Balance table with strain gauges.



The International Ultraviolet Explorer is a synchronous satellite which maintains an Equatorial West-to-East orbit of the Earth, at an altitude of about 35,900 km, at which height it makes one revolution in 24 hours, synchronised with the Earth's rotation.

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Max Gasser is an engineer at the NASA Goddard Space Flight Centre, and was the manager for the hydrazine auxiliary propulsion system on the IUE spacecraft. His interest in collecting coin scales, stems from his main hobby of collecting coins.

FIG 3. Diagramatic views of the IUE balancing table used to obtain the even distribution of fuel in its six tanks.

NOTES & QUERIES

NQ 25 SIX OUNCE WEIGHTS (NQ 16) note from R.Rix.

According to my information, between 1897 and 1915 the postage rates in Britain were 1d for 4oz., 1½d for 6oz. etc, which would explain the six ounce weights.

COMMENT from the Editor.

The normal range of postal weights ¼,½,1,2,4,8 oz. covers all of the intermediate values, so was it just a matter of convenience to make six ounce weights ? The rates continue 4,6,8,10,12,14,16 oz., so why not 10 oz. or 14 oz weights ?

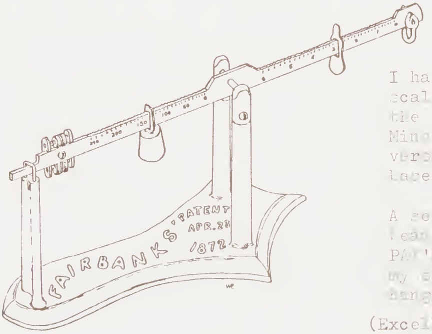
Has anyone any other suggestions ?

NQ 24 CRONTAL (NQ 17) notes from H.Nentwich and R.Rix.

Maybe Crontal means Kronthaler or Kronenthaler, which was an Austrian silver coin from 1755, weight 29.477 gram. Baden, Bavaria, Brabant, Hessen, Nassau, Saxe-Coburg and Württemberg also coined Kronenthalers.

NQ 25 FAIRBANKS PRESCRIPTION SCALE

note from W.P.Lindeyer.



I have just acquired a Fairbank's scale very similar to the one on the cover of the Winter 1979 EQM. Mine is apparently an earlier version bearing on the cast iron base the patent date April 23, 1872.

A second date is shown on the brass beam under the adjustment nuts, PAT'D AUG 20, 1873. Unfortunately, my scale is missing the pan and its hanger.

(Excellent drawing, Bill. Thanks - Ed)

NQ 26 AMERICAN MANUFACTURERS

query from A.R.Eaches.

Can anyone supply the following information about two American scale companies ?

COMPUTING SCALE CO - what types of scales were made, and what were the methods of dis-assembly and of calibration ? At what dates were the various serial numbers used ?

WATLING MFG. CO. - what types of scales were made ? When was the Company in Chicago, and what was their address?

Can any member help ?

NQ 27 EARTHENWARE WEIGHTS

notes from members.

Gillian Dick stated in her article (EQM p83-86) that the lowest weight was one ounce, but I have a porcelain weight marked IMPERIAL ½ oz. It has an unmarked lead plug, and weighs exactly half an ounce.

from L.A.uit den Boogaard.

There seem to be a variety of marks impressed underneath earthenware weights, for example I have the following : A 7 lb. weight with 7 marked underneath; a 4 lb. one with 4 and 9 underneath; a 1 lb one with WEDGWOOD 1 ; and another 1 lb. weight has the letter R (assumed to be the Registration code for 1861).

from J.Lound.

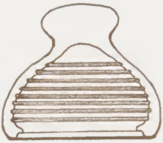
I have an earthenware weight marked 200 GRAMMES on top of the knob and W.& T.AVERY BIRMINGHAM around the base. Another example has 4 lb. IMPERIAL ENAMEL WEIGHT on the knob, H.PARNALL & SONS BRISTOL around the base and underneath it is impressed WEDGWOOD O P KIA.

from W.W.Doniger.

(continued overleaf). ⟹

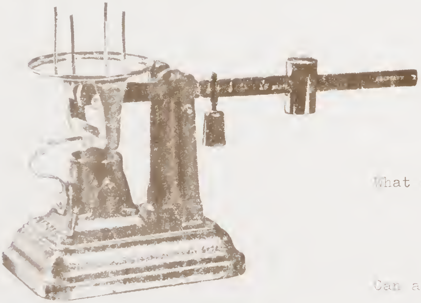
Recently I saw a 14 lb. earthenware weight which had never been filled with lead. The walls were relatively thin and the interior surface had been heavily scored with parallel grooves, presumably to hold the lead firmly in place.

from D.F.Crawforth.



LQ 28 SCALE WITH PINS

query from V.Denford.

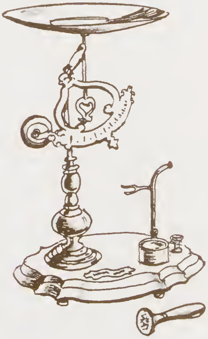


I have enclosed an illustration of a Fairbanks scale, length 235mm (9¼in) with four pins 30mm high and set 28mm apart on the pan. The graduations on the beam are 0,3,4½,9, and 18 grams.

What was this scale used for ?

Can any member help ?

CAVEAT EMPTOR



This reproduction scale was illustrated in a well known American mail order catalogue of March 1979. It is claimed to be a perfect copy of a weighing instrument described in the notes of Leonardo da Vinci!

The brass scale is imported and mounted on a wooden base which has been treated to simulate age and use. A brass label on the base is marked 'Royal Post'.

A bronze seal is provided with a 'Georgian' insignia and is used with the sealing wax in the container mounted on the base. The seal is suspended by the brass wire fork.

Height 17 ins. (430mm). Price $ 245.

Cataloguing a collection

BY M.A.CRAWFORTH

Cataloguing a collection of scales serves a dual purpose. It enables you to retrieve information quickly, and it makes you think about your collection in detail. To me, the latter is the most important aspect, and I have learnt more about scales by handling them, describing them and researching information about them in order to make my catalogue, than by any other means. So, from this point of view, the more detailed you try to make your description of a scale, the more you will learn.

Various methods can be used for compiling a catalogue; it can be done by number, by date, by purpose, by manufacturer, by mechanical type or by the country of origin, or by combinations of these aspects. There is no 'correct' way to catalogue, only the best way for your purpose, depending upon the information you wish to retrieve and what you hope to learn. If your collection is very specialised, say only letter scales, or only coin scales, then cataloguing by maker, by mechanical type, or by date may be the best system. If your collection sets out to portray the principle weighing devices, then cataloguing by mechanical type would be essential. However, most collectors accumulate scales of all types and dates, for all purposes, and it is this type of collection which presents the most complex cataloguing problem, so I shall deal with it in detail.

I have found that the most interesting and most useful aspect of a general collection is the purpose for which the scales were made. The purpose encompasses many facets; the historic, the mundane, the exotic, the obscure, the scientific and the incredible. Of almost equal interest and importance is the mechanical type - the ancient, the new, the rare, the common, the unusual - so, it is upon these two main aspects that I recommend a catalogue should be based.

The first thing to do is to give every scale a number, but beware of trying to include too much information in the number - keep it simple. Numbers which include digits to indicate the type or purpose of the scale are cumbersome and do not really help to identify a specific instrument.

In my system the scales are numbered in the order of acquisition, the most recently acquired scale being allocated the next free number. This is of no real consequence, and existing collections may be given numbers on any arbitrary basis without affecting the system. A small self-adhesive label bearing the number is then attached to each scale underneath, or in some other position normally out of sight*. Each scale is then given a complete page in the catalogue. This page has all the information about the scale which can be discovered, and further additions are made as new knowledge is acquired, Fig. 1. These pages

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* WARNING: do not use self-adhesive labels on any materials such as leather, paper, ivory etc. which may be damaged by the adhesive.

The scale shown is catalogued as No.[illegible] in Figs. 1 and 2.

are retained in a ring binder, in numerical order, so that they can be supplemented or replaced easily, (a card index can be used in the same way). If I remove a scale from the collection the number is re-allocated to a new acquisition. In this way, no gaps appear in the numbers.

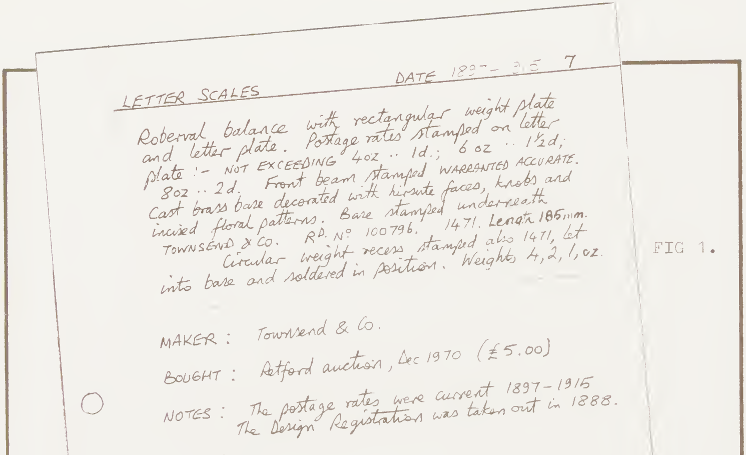
The information recorded for each scale includes a basic description of its physical characteristics, any markings made by the maker or retailer or by inspectors, and any other feature which seems unusual or which may help to determine the date of manufacture, purpose etc.. Of course, sometimes there is very little to record, and other times information is abundant. I recommend that a catalogue should set out to include the following information wherever possible or appropriate :-

1. PURPOSE. e.g. bread scale, letter scale, coin balance, unknown, etc.
2. MECHANICAL TYPE. e.g. steelyard, spring balance, Roberval etc.
3. WEIGHING CAPACITY. e.g. graduations 0 to 20 lb. by $\frac{1}{4}$ lb.
4. WEIGHTS. - their type and denomination.
5. MAKER. - trade mark, country of origin etc.
6. DATE. - exact or approximate, with supporting evidence.
7. MAIN DIMENSIONS.
8. MARKS. e.g. verification, registration, patent number, etc.
9. MATERIALS from which the scales, weights and box are made.
10. INTERESTING FEATURES. e.g. type of beam end, decoration, unusual principle of operation, provenance, etc.

Once the catalogue is compiled in this way, information about any scale can be retrieved by the number given to the scale. However, I find that I frequently want to refer to a scale in the catalogue from its type and purpose, without having to go to the scale to get the number. So, I also have an index to the catalogue, where the purposes are listed alphabetically, for example, Apothecary; Banker's; Bread; Coin; Diamond; Egg; Estimating, and so on.

Each of these categories is sub-divided into mechanical type, Equal-arm; Pendulum; Steelyard, etc. Each scale is entered in the index on a single line which includes only the briefest possible key recognition features, and the scale number, Fig 2.

If it is not possible to specify the purpose - which is often the case,



LETTER SCALES DATE 1897 – 1915 7

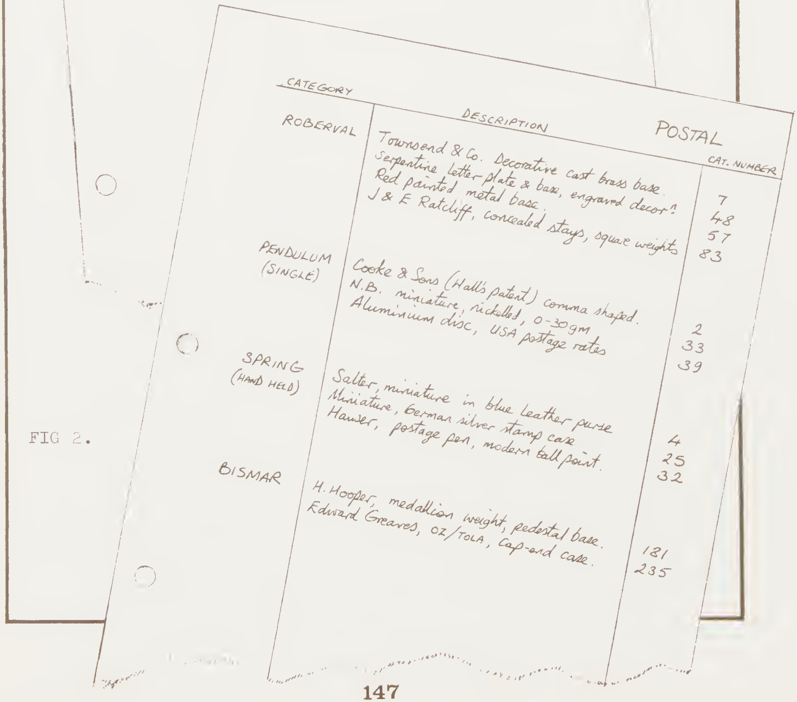
Roberval balance with rectangular weight plate and letter plate. Postage rates stamped on letter plate :- NOT EXCEEDING 4oz .. 1d.; 6 oz .. 1½d; 8oz .. 2d. Front beam stamped WARRANTED ACCURATE. Cast brass base decorated with hirsute faces, knobs and incised floral patterns. Base stamped underneath TOWNSEND & CO. RD. Nº 100796. 1471. Length 185mm. Circular weight recess stamped also 1471, let into base and soldered in position. Weights 4, 2, 1, oz.

MAKER : Townsend & Co.

BOUGHT : Retford auction, Dec 1970 (£5.00)

NOTES : The postage rates were current 1897–1915
The Design Registration was taken out in 1888.

FIG 1.



POSTAL

CATEGORY	DESCRIPTION	CAT. NUMBER
ROBERVAL	Townsend & Co. Decorative cast brass base.	7
	Serpentine letter plate & base, engraved decor?	48
	Red painted metal base.	57
	J & E Ratcliff, concealed stays, square weights	83
PENDULUM (SINGLE)	Cooke & Sons (Hall's patent) comma shaped.	2
	N.B. miniature, nickelled, 0-30gm	33
	Aluminium disc, USA postage rates	39
SPRING (HAND HELD)	Salter, miniature in blue leather purse	4
	Miniature, German silver stamp case	25
	Hauser, postage pen, modern ball point.	32
BISMAR	H. Hooper, medallion weight, pedestal base.	181
	Edward Greaves, oz/TOLA, cap-end case.	235

FIG 2.

especially with multi-purpose designs - the scale is listed in the category General Purpose. However, if the design of the scale is clearly for some special, but unidentified purpose, it is indexed under Unknown Purpose. If the true function is discovered at a later date the entry is then transferred to that purpose.

As mentioned above, a major reason for cataloguing is to provide for the easy retrieval of information, and the system described above provides the following :-

1. Access by purpose.
2. Access by scale number.
3. Access by mechanical type.
4. Access to the total number of scales.
5. Access to the number of examples in each category.
6. Access to the number of examples of a mechanical type.
7. Flexibility when making additions, corrections, replacements.

All this may seem formidable, but, like many straight forward things, it is much more complicated to describe the procedure than to carry it out - all I have described is included in Figs. 1 and 2. So, don't be put off, start cataloguing one step at a time and you will be surprised how soon the information builds up, and how much knowledge you gain. Moreover, one finds many details on the scales which had previously been missed !

If you are uncertain of the purpose and mechanical types of scales, there are I.S.A.S.C. publications to help you. The Guide to Weighing Instruments illustrates over 100 different scales ranging from the commonplace designs to very rare types, all categorised into their mechanical type. It also provides information about their makers, dates of manufacture, Registration numbers, dates of postage rates etc.* Also, starting in the next issue, there will be an illustrated glossary of terms for weighing apparatus.

FIG 1. A typical catalogue page for scale No.7. with the dates in pencil for later amendment if better dates are discovered.

FIG 2. Part of the postal section of the index showing the single line entries for each scale, arranged under the various mechanical types. In practice more space must be allowed for additions.

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* Available, price $ 10 post free, from Bob Stein in Chicago.

SOME 'BAA'LANCE ! "New Zealand scientists have developed an instrument for weighing sheep that operates on the principle of the Wheatstone bridge. The weighing platform is supported on four balloons filled with water, and the weight of the sheep on the platform pushes water into calibrated glass columns. They call it, regrettably, the 'Sheepstone bridge'."

from Electronics Weekly.

ISASC

EQUILIBRIUM

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

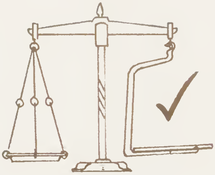
M.A. CRAWFORTH, EDITOR

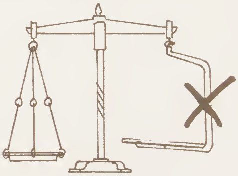
AUTUMN, 1979

PAGES 150, 155

EDITOR'S COMMENT

Don't hang about !





The convenience of using a cranked hanger, instead of cords or chains, was recognised centuries ago. With the hanger set out of the way, access to the goods plate was quick and unrestricted. Overhanging loads could be weighed, and scoops could be removed and replaced unhindered - which was the whole point of this design. So, when displaying scales, make sure that the hanger is the right way round, near to the centre of the beam where it can provide the least obstruction. (It is to be seen in this position in any maker's catalogue).

Newsletters

Before Equilibrium was introduced, ISASC members were expected to take their turn in writing a newsletter. Some very interesting material was produced, ranging from the mathematics of steelyard design to detailed and illustrated accounts of unusual scales in the member's collection.

We have received many requests for the old newsletters to be made available to new members, so an edited selection will be published in EQM. Early members will have the convenience of being able to file the information in the consistent format of the magazine.

The first letter selected for reprinting is Denis Vorley's work on early Arabic glass weights, and it appears in this issue.

COVER PICTURE

Gold miner's pocket scales manufactured for the Alaskan gold rush which started in 1898. The painted tin box contains a brass beam and pans with Troy weights. The maker is not known.

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

Bob Stein, Chairman — 20 North Wacker Drive, Chicago, IL, 60606 U.S.A.
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Symposium '79

PAPER PRESENTED
BY W.W.DONIGER

SCALES OF THE GOLD RUSH

When a few nuggets were picked from a stream in Culloma, California over 130 years ago, the news spread like wild fire ! People flocked to the site from all over the world, driven by the desire for vast wealth, and before the rush was over, some half million people were involved in one of the world's most important migrations.

We are holding our first International Symposium here, in San Francisco, where it all started. This city played an important role in gold rush history, not only for the famous miners and prospectors who passed through its port, but also in the sheer amount of precious metals extracted and shipped from California's shores. Most of the minerals uncovered by these early pioneers came from a long belt stretching for 120 miles along the west face of the Sierra Nevada range.

In the fifty years following California's gold rush, more gold discoveries were made in other parts of the world. They occurred in such far-flung outposts as Australia in 1853, British Columbia in 1857 and Alaska in 1898. In every part of the world where gold was discovered, miners faced similar problems, and they used the same basic equipment that the Californians had used. Every miner relied upon his pick and his sluice box to extract gold, but he relied equally upon his scales and weights to evaluate his hard-earned finds.

These finds came in various forms and grades of fineness. Most commonly they were flakes, nuggets or particles extracted from crushed ore. Such nuggets or gold dust had to be used by miners and merchants for barter to carry on their necessary business, because money of any kind was extremely scarce in the gold fields. Gold dust was carried in a buckskin pouch, or "poke", and had to be poured out on to the merchant's scales to determine the amount which would pay for the purchases. The merchant usually had a triangular metal pan into which gold was poured. While pouring, he would blow the dirt and impurities away, as the gold, being much heavier, fell into the pan.

These occasions were wide open to fraud, and the miner had to check carefully that the merchant did not blow his precious gold away with the impurities - such merchants swept up very carefully in their shops ! Other unscrupulous merchants placed false weights in their gold scales, or used concealed magnets to increase the amount of gold they received. On the other hand, miners could deceive merchants by including brass dust with their gold.

Gold dust was taken at $16 to the ounce Troy[1], so, if a dollar's worth of goods was wanted, everyone knew that you needed one pennyweight (equal to 80¢) and six grains (20¢). Balancing was a delicate business, because, not only were the grain weights very small, but minute quantities of

GOOD NEWS
FOR
MINERS.

NEW GOODS,
PROVISIONS, TOOLS,
CLOTHING, &c. &c.

GREAT BARGAINS!

JUST RECEIVED BY THE SUBSCRIBERS, AT THE LARGE TENT ON THE HILL,

A superior Lot of New, Valuable and most DESIRABLE GOODS for Miners and for residents also. Among them are the following:

STAPLE PROVISIONS AND STORES.

Pork, Flour, Bread, Beef, Hams, Mackerel, Sugar, Molasses, Coffee, Teas, Butter & Cheese, Pickles, Beans, Peas, Rice, Chocolate, Spices, Salt, Soap, Vinegar, &c.

EXTRA PROVISIONS AND STORES.

Every variety of Preserved Meats and Vegetables and Fruits, [more than eighty different kinds] Tongues and Sounds; Smoked Halibut; Dry Cod Fish; Eggs fresh and fine. Figs, Raisins, Almonds and Nuts; China Preserves, China Bread and Cakes; Butter Crackers, Boston Crackers, and many other very desirable and *choice bits.*

DESIRABLE GOODS FOR COMFORT AND HEALTH.

Patent Cot Bedsteads, Mattresses and Pillows. Blankets and Comforters. Also, in Clothing—Overcoats, Jackets, Miner's heavy Velvet Coats and Pantaloons, Woolen Pants, Guernsey Frocks, Flannel Shirts and Drawers, Stockings and Socks, Boots, Shoes; Rubber Waders, Coats, Blankets, &c.

MINING TOOLS, &c.; BUILDING MATERIALS, &c.

Cradles, Shovels, Spades, Hoes, Picks, Axes, Hatchets, Hammers, every variety of Workman's Tools, Nails, Screws, Brads, &c.

SUPERIOR GOLD SCALES. MEDICINE CHESTS, &c.

Superior Medicine Chests, well assorted, together with the principal Important Medicines for Dysentery, Fever and Fever and Ague, Scurvy, &c.

N.B.–Important Express Arrangement for Miners.

The Subscribers will run an EXPRESS to and from every Steamer, carrying and returning Letters for the Post Office and Expresses to the States. Also, conveying "*GOLD DUST*" or Parcels to and from the Mines to the Banking Houses, or the several Expresses for the States, insuring their safety ——— The various *NEWSPAPERS*, from the Eastern, Western and Southern States, will also be found on sale at our stores, together with a large stock of *BOOKS* and *PAMPHLETS* constantly on hand.

Excelsior Tent, Mormon Island,
January 1, 1850.

ALTA CALIFORNIA PRESS

WARREN & CO.

gold were valuable. A pinch of gold dust was worth about one dollar. In fact, a pinch often passed for a dollar in the absence of scales, which led to another trick by the unscrupulous trader. He would surreptitiously wet his fingers to make extra gold stick to them.

The average clean dust from California was worth well over $18 per ounce Troy at the Philadelphia Mint. It was there that the gold was melted down and its impurities removed. Then it was made into gold bars, so that the assayer could assess its true value. Thus, at every stage the gold was weighed and re-weighed:- when it was found, when bartered, when received at the Mint, and when it was assayed - consequently, scales were needed in great numbers.

In 1849, at the start of the Gold Rush, scales were scarce and in such great demand that San Francisco's only jeweller, Mr.B.R.Buckalew, was hard pressed to provide an adequate supply. Gold scales ranged from large, finely-made jewelled balances shipped around Cape Horn, to small pocket scales imported from Europe[2]. Significant numbers of these came from Germany, England and France. In addition to the scales imported by traders, many gold-seeking immigrants brought a set of scales with them on the long trek to California. Most of the weights that accompanied these scales were of the Troy system, in ounces, pennyweights and grains.

Due to the shortage, just about every type of weighing device was used, as long as it was reasonably accurate and functional. If manufactured scales were not available, any make-shift device was used. The story goes that in some of the mining town express offices, gold had to be weighed on scales consisting of a piece of plank, balanced as nearly as possible on a central fulcrum. Discarded sardine tins were nailed to each end of the plank for use as scale pans , one to hold the gold dust and the other for the weights ! If weights were also in short supply, silver dollars were used instead, one dollar weighing about 17 pennyweights, (20dwt = 1oz Troy). Alternatively, many weights were home made, using various materials and shapes, whatever was convenient.

Obviously, few of these fascinating make-shift devices have been saved or collected, but an indication of the variety of professionally made scales used during the California and Alaskan gold rushes is shown in Figures 1 to 12, and in the Cover Picture.

➢

* *

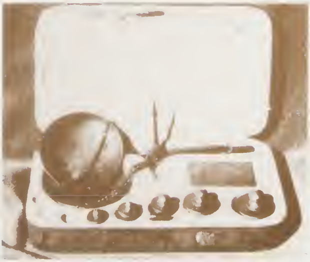
REFERENCES

1. California History Nugget - "Making Money in Early California" by Theodore Solomons, December 1938, page 80.
2. History of Banking in California. by Ira B.Cross 1927, page 121.

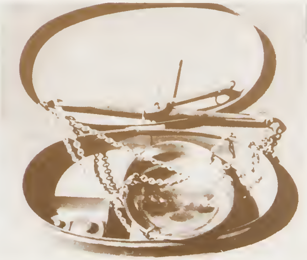
Bill Doniger has a magnificent and varied collection, and has a large library of background literature. He has a special interest in Goldrush topics and collects artifacts of the period. He was the organiser of ISASC's first Symposium, and he compiled the catalogue for the accompanying auction.

1a

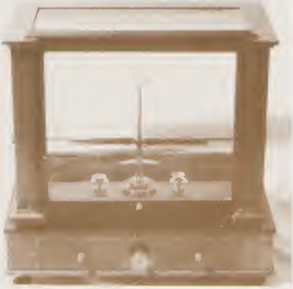
3a



1b



3b



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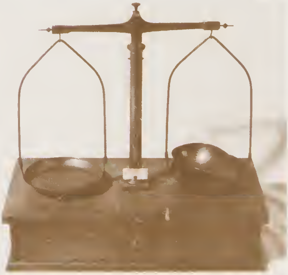


4

KEY TO THE ILLUSTRATIONS.

FIGS 1a & 1b. A very fine example of gold rush scales used throughout California during the Goldrush. Leather was used to cover the rectangular box 7"x4"x1½", with the legend stamped in gold on the lid 'Miner's Companion'. The interior was lined with chamois leather. The hand-held balance has a 6" brass beam with 2½" brass pans on chains. There were eight brass weights from 1dwt to 2oz Troy.

FIG 2. Assay balance made by S.Keller, Salt Lake City, Utah, about 1870. These finely made and sensitive instruments were used extensively in the field for on-the-spot assay work. They survived the rugged conditions without loss of accuracy, and were known in the trade as'button balances' from the button-sized drop of gold used in the tests. The balance has knife edges and polished agate bearings and is quick and positive in action. It is provided with a rider bar and rider weight, skeleton hangers, arrestment gear and levelling screws. It is mounted on black plate glass inside a polished mahogany case with a counterpoised sliding door. Button balances were made in a variety of sizes,shapes and sensitivity, (see also Fig 12).

FIGS 3a & 3b. This scale is typical of those used during the Goldrush, and it was made in various sizes and several different colours, green, orange, blue and red. The oval metal box has an eagle and wreath border on the lid. The hand held balance has a 5" brass beam and 2½" diameter pans. Troy weights in the locker are marked in grains.

FIG 4. Manufactured in America c1850, this scale served as a jeweller's balance as well as a gold scale. The brass beam, hangers and pans were set up on a mahogany box, and Troy weights are stored in the drawer below. The balance is raised for weighing by depressing the lever, and in one pan there is a flat brass disc marked "Counterpoise for scoop scale". The other pan holds a small brass scoop for the gold. Size 18"x9"x17".

FIGS 5a & 5b. German and American in design, this scale was popular in California. Compare it with the smaller version shown in Figs 9a and 9b. The rectangular metal box has the legend imprinted in gold on the lid 'Miner's Improved Gold Scale - Manufactured Expressly for California'. A large flying eagle also adorns the lid. The box measures 7"x3"x1½", and houses a brass beam with 3" brass pans on chains.

FIG 6. A scale of French origin which was made c1860, and fitted in a box 7"x3½"x1". The brass beam has brass pans and chains. There is a set of six nesting brass weights from ¼oz to 4oz Troy, and fractional weights in the locker. This particular example was used in the Yukon gold rush.

FIG 7. An Alaskan scale made about 1880, and possibly of French origin. Scales of this type had 'Alaska' painted on the lid, (see Front Cover). A set of brass Troy weights ranging from 1dwt to 2oz, is stored in a wooden block secured in the metal box which measures 9"x4½"x2".

5a

7

5b

6

8

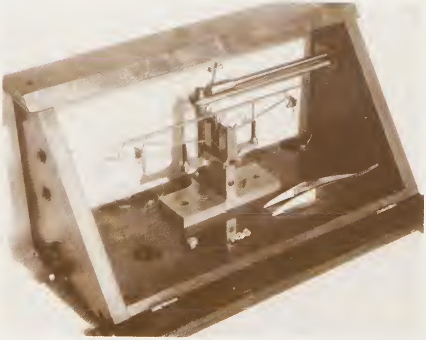
9a

9b

11a

11b

10



12

FIG 8. This Chinese gold scale is in the decorative style of the 18th and 19th centuries. Such scales were brought to California by Chinese miners, and they were used extensively for weighing precious metals and many other commodities. The 13" long iron beam has box ends of English derivation, with $5\frac{1}{2}$" diameter pans on silk cords. It is supported by an iron column, and the complete set can be stored in the drawer of the teak chest. The chest is decorated with brass inlay in the Oriental style, and has brass carrying handles. The weights have the attractive Chinese concave/convex shape reminiscent of a violin.

FIGS 9a & 9b. This scale is very similar in design to the one shown in Fig 7, but it is smaller and has a different eagle on the lid. The scales are virtually identical in shape.

FIG 10. These typical Chinese do'tchins were used throughout the gold fields by the Chinese miners who brought them from their native land. They are steelyards with a slender ivory beam graduated in the Chinese decimal system. Both the pan and weight are of brass, and they are suspended by silk cords. There are three alternative silk suspension cords for three ranges of weight. The cases are typically violin shaped or fish shaped, and may be made of bamboo or other woods. Such scales were used for dispensing herbs and medicines in addition to weighing gold.

FIGS 11a & b. An American bullion balance made by Henry Troemner & Co. of Philadelphia, in the late 19th century. Balances like this were used in assay offices, banks and other places where fine and sensitive weighing was required. The bronze beam has a capacity of 500 ounces Troy and is sensitive to $\frac{1}{2}$ grain with the full load. An iron column supports the balance, and relieving gear lifts the knife edges off their bearings when the scale is not in use. The mahogany base has adjustable screw feet and a level.

FIG 12. This portable button balance was used in the field for accurate assay computations. The diminutive size can be judged by the tweezers. When the glass front is closed, the rider weight can be positioned by using the brass lever above the beam. The beam is 6" long and the pans are only $\frac{3}{4}$" in diameter. It was made by the Keller Balance Manufacturing Co. Salt Lake City, Utah.

* * *

Don't forget – make YOUR contribution to Equilibrium - Articles, your views and comments, notes and queries, a photograph and description of an interesting scale in your collection, contemporary comments, old advertisements - in fact, anything which might interest your fellow collectors. All contributions will be gratefully received and considered for publication.

NOTES & QUERIES

NQ 29. OERTLING OF LONDON

query from G.Thürkôw.

Do you have any information about Oertling of London, manufacturer of pharmaceutical balances ?

REPLY

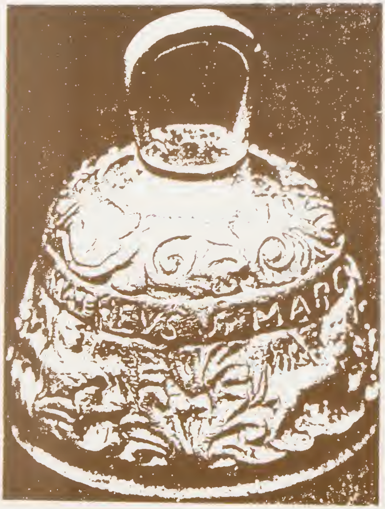
from the Editor.

Ludwig Oertling came to London and started manufacturing precision balances in c1846. Over the years, he had various addresses (I have recorded six), and he extended his range of products to include assay, bullion, diamond and sovereign balances. In the early 20th C. the firm became **L.Oertling Ltd**, and then in 1925 it was taken over by W.& T. Avery Ltd.

NQ 30. UNUSUAL WEIGHT

query from D.Smith.

I picked up a weight some years ago and am hoping you can supply some information about it. As you can see, it is a small bell shape 2 3/8 ins. diameter at the base and 2 3/4 ins. high to the top of the handle. It weighs 1lb 14oz 2½drams (about 854.7grams), and has No.2 stamped into the top of the shoulder. It is made of brass and filled with lead, and underneath it is stamped with a 2, a 2 on a crown, a cross and various other imperfect marks. They are incuse, although in the illustration they appear to be embossed.



Can anyone tell Denis where his weight originated, and if it had a special purpose ? - Editor.

NQ 31. GUINEA SCALES

query from H.Chandler.

I would like to establish an approximate date for my set of guinea scales. It was apparently used in Hong Kong because there is a painted Chinese scene on the cover of the oval tin box. One of the problems I have is the lack of literature to aid determination of age of some of my small English balances and weights. Any help you can give me would be appreciated.

REPLY

from the Editor.

Your scales were made in England in the middle of the 18th century, for use in England when there was a great enthusiasm for the Chinese style of decoration. Although a great many English products had such decoration, scale boxes bearing these scenes are rare.

If you want to know more about English money scales and weights in great detail, you must get the book Money Scales and Weights by Sheppard & Musham, published by Spink & Son, London. It is fantastically good value for money at about £6 plus p & p.

Newsletter

FIRST CIRCULATED IN 1977

ARABIC GLASS WEIGHTS

BY D.G.VORLEY.

According to Arab tradition, it was during the reign of the Umayyad Caliph Abd al-Malik (65-89 A.H. = 687-711 A.D.) that the advice was given, and presumably acted upon, to issue weights of glass for the purpose of testing coins, the idea being that the glass would not be "susceptible to alteration either by augmentation or by diminution", in that any tampering would easily be detected. The clipping of coins has, of course, been a common practice from the earliest times, and coins therefor, were more frequently accepted by weight than by number.

This belief, in the accounts of the Arab historians, that glass weights were an Umayyad invention, is incorrect as Byzantine glass weights are known to exist. It is also known from the pieces themselves, that early in the 8th century A.D. glass coin weights were being made in Egypt with the names of the governors who authorised them.

There were three main types of early Arabic glass coin weight - the dinar (with its half and third), the dirhem and the fals (plural falus). The legal weight of the dinar was 4.25 gram (the half 2.125g.and the third 1.42g.). The legal weight of the dirhem was 2.97 grams, but the fals denomination presents certain complexities. In the first place, there seems to have been no uniform standard of weight for the copper fals as it varied in size and weight. Although theoretically, there was a 48 to 1 relationship between the fals and the dirhem, in practice falus in different provinces and cities had different values and varying purchasing powers. An agreement was usually reached by weighing the falus and relating them to the known proportion of copper to the dirhem at any given time. For this purpose, numerous varieties of weight were employed as indicated by the figures 9, 14, 15, 20, 25, 27, 30, 32 and 33 kharroobehs (an equivalent of the carob seed).

This suggestion is that of Lane-Poole's, but Petrie suggests that the fals weights were used for testing the weight of gold and silver coins of foreign origin, which in early days doubtless circulated in Egypt in large quantities. A further suggestion by George C. Miles of the American Numismatic Society is that these fals weights were used in payments of dinar fractions smaller than halves and thirds.

To manufacture the weights a button of molten glass was poured from a ladle or crucible on to a flat iron plate. An iron die was then pressed against the disc of hot glass to produce the inscription. The raised ring of glass around the edge of the weights is invariably uniform in size. However, the discs are sufficiently irregular in shape to show that they were cast in depressions in an iron plate.

The remarkable uniformity in weight of the several types of coin weight is an indication of the skill of the 8th century glass makers. In any repetitive process, such as ladling out a small amount of glass into which an inscribed iron stamp is pressed, it is possible to attain sufficient dexterity to pour almost identical amounts of glass for successive stampings.

Glass weights were relatively cheap to make and could be prepared in large quantities, so it would be quite feasible to weigh the weights after manufacture and to reject those that differed from the standard. Such discarded pieces could easily be re-melted and reshaped. Beside these flat coin weights, there were also heavier disc and ring weights.

The predominant colour of these glass weights was blue-green, varying from a pale gray-green in the half dinar coin weights, to a very deep green in the thick gobs of glass that formed the ring weights. Much of the colour range is due to the thickness of the weights, for the greater the depth of glass through which light must pass, the more light is absorbed and the darker in colour the glass appears. The pale blue - green colour predominates, but the occasional occurrence of other colours such as cobalt blue and amber among the early pieces invalidates any general conclusions.

The blue-green colour and its variants were formed by the action of copper and iron in the glass, and the amber by, possibly, the addition of a small amount of sulphur. Cobalt and manganese were also used for the different shades of blue. Weights of 1170 to 1225 A.D. and later were opaque and they occurred in many colours including white, cream, yellow, amber, turquoise, deep claret and dark and light brown.

High standards were maintained by official inspection, and Magrizi wrote an account of the system in his work of the fifteenth century, but his sources were earlier. In the following passage he described a practice which probably originated in Umayyad or Byzantine times:-
"There was for the control of weights and measures a place known as the Dar al-Ayar or Bureau of Standards, in Cairo, in which all the scales and weights were tested. Everything that was necessary was supplied, such as copper, iron, wood, glass and other equipment, while craftsmen, supervisors and the like could be hired. The Inspector of weights and measures, or his deputy, went to the Bureau so that everything made there could be tested in his presence. If they were correct he certified them, if not, he ordered them to be remade until they were correct."

"There were, in the Bureau, patterns for testing the accuracy of the standards; and weights, scales, and measures of capacity were not sold anywhere except in this Bureau. All merchants, when summoned by the Inspector of weights and measures, came to the Bureau with their scales and weights and measures for immediate testing. If they were found deficient they were taken from the owners and destroyed, and the owners were required to buy others, which were accurate, and to pay for them."

****

NOTE: In the Museum of the American Numismatic Society there are 95 carob seeds presented by J.B.Nies at the time of his bequest of glass weights. These presumably, were obtained in Egypt at the same time that he purchased the glass weights, and their average weight is 0.19455 gram. They, like the grain, are the unit of weight for Arabic coins.

****

REFERENCES

Numismatic Notes and Monographs No. 111.
Early Arabic Glass Weights and Stamps. by George C.Miles, published by The American Numismatic Society in 1948.
Catalogue of Arabic Glass Weights in the British Museum. by Stanley Lane-Poole, 1891
Glass Stamps and Weights illustrated from the Egyptian Collection in University College. by Sir Flinders Petrie, 1926.

Denis Vorley is a retired Police Superintendent with a small but good collection of scales and weights. As his major interest is collecting coins, he recently withdrew from ISASC, but continues to be interested in our Society's welfare.

REVIEW

WEIGHTS AND SCALES by Felice Mehlman.

This three page article has 19 attractive illustrations of scales for letters, shops, banks and people. It is a small but useful addition to scale literature, marred by a few inaccuracies. For example, three bank scales with tripod stands are, unfortunately, described as grocer's scales. Also the prices mentioned are higher than normal in London.

'Weights and Scales' by Felice Mehlman, is in the monthly magazine Antique Collector, Sept.1979, from Magazine House, 72 Broadwick Street, London WIV 2BP.

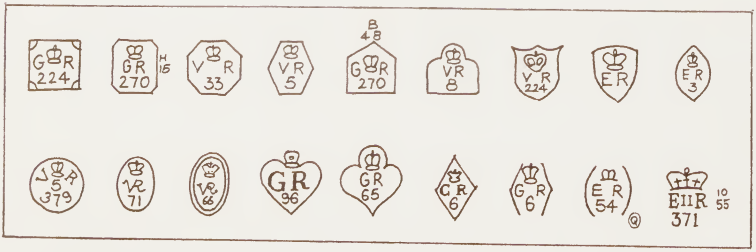
BRITISH VERIFICATION MARKS
Supplement

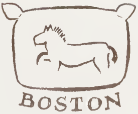
BY M.A.CRAWFORTH

Since concluding the series of articles on British marks, more examples have come to light, sent in by members or seen by the author. They are shown in the following supplement.

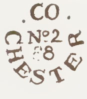
Below are some of the varied interpretations of the 'uniform' system introduced in 1878. It will be noticed that some districts had more than one design, and two examples are shown for district 6 (Birmingham) and for district 270 (West Bromwich). Other examples may be encountered from time to time. These variations may have been used to signify different years or different inspectors.

It is hoped to publish further supplements in the future, so please check YOUR weights for marks, and send details to the author.

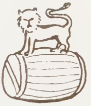




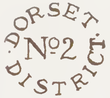
Boston Bo.



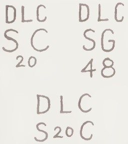
Chester Co.



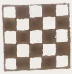
Congleton Bo.



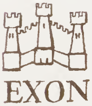
Dorset Co.



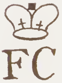
Dublin Co.



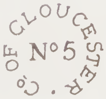
The Receipt of the Exchequer.



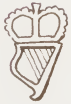
Exeter City.



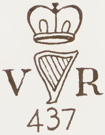
Folkestone Bo.



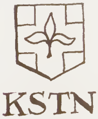
Gloucester Co.



Ireland



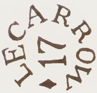
Ireland



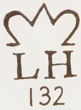
Lincoln Co.
Kesteven.

HULL

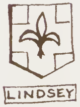
Kingston upon
Hull Bo.



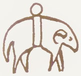
Lecarrow Bo.



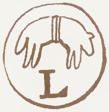
Lincoln Co.
Holland.



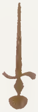
Lincoln Co.
Lindsey.



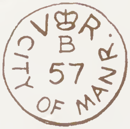
Leeds Bo.



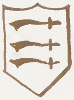
Leeds Bo.



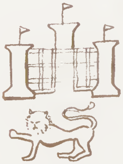
London City.



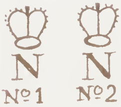
Manchester City.



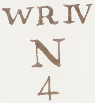
Middlesex Co.



Norwich City.



Nottingham Co.



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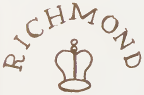
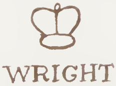
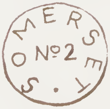


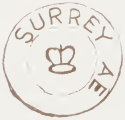
Richmond Bo.



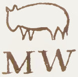
Salford Bo.
(Inspector
named Wright).



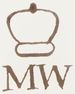
Somerset Co.



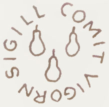
Surrey Co.



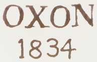
Manor of
Wakefield Bo.



Manor of
Wakefield Bo.



Worcester Co.



Oxford Co.

SIMPLE WEIGHTS for COINS

BY M.A.CRAWFORTH.

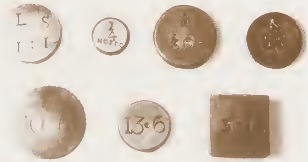


FIG 1.

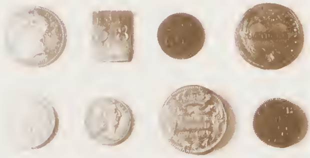


FIG 2.

It is customary for writers on English coin weights to refer to the plain brass discs or squares, stamped with the monetary value of the relevant coin, as "home-made weights", Fig.1. This term is, I believe, erroneous and misleading. Although they are not decorative, such weights were made with reasonable skill, and my tests (of 56 weights) indicate that they were made as accurately as the die-stamped decorative weights now cherished by weight collectors, Fig.2. The weights were made simply, but not crudely, and required the use of number and letter punches which only the professional was likely to have available. I contend that they were made by weight and scale makers as an inexpensive, but thoroughly practical product. This is why some examples have a maker's name or a verification mark - their only embellishment, Fig.3.

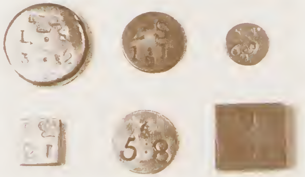


FIG 3.

There can be little doubt that anyone concerned with lasting accuracy would have preferred these plain weights with incuse marks, which were much less susceptible to wear than embossed decoration on the more elaborate weights. In fact, it was for this reason that Royal Mint officials changed from embossed weights to incuse designs for their new sovereign and half sovereign weights, in 1843. It was noticeable, during my tests, that even slight wear on the embossed weights gave substantial errors. It seems probable, therefor, that the majority of weights in use, in the 18th century, were these plain weights, and that decorative ones were the expensive, and less practical, luxury of the time. Of course, it is the attractive decorated ones which have been considered most worthwhile preserving by successive generations and collectors.

Truly home-made weights are very different. They were usually made from any handy material, and I have seen examples made from off-cuts of sheet metal, wire, lumps of lead, washers, ball bearings, collar studs, lumps of sealing wax and unwanted coins or professionally-made weights filed down to the value required, Fig.4. They have several factors in common; they are crudely finished, they are not matching in shape, they have the weight or value marked by scratching with a pointed implement or written in ink, some are not marked at all, and, in general, their accuracy is poor.

It is time that a proper distinction is made between these various types of weight, and that the simple, but professionally made ones are given the recognition they deserve. I propose the use of the following terms:-

Decorative weights; Plain weights; Home-made weights.

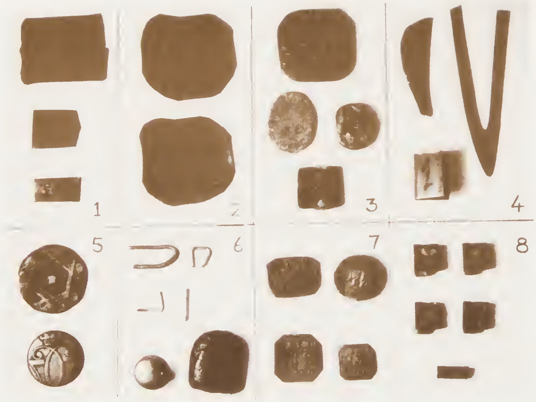
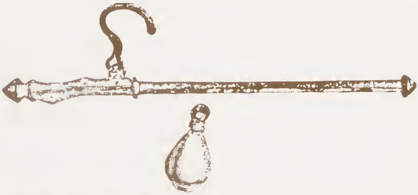


FIG 4. Home-made weights.

KEY.
1. Sheet brass weights, 2 unmarked. 32gn.($\frac{1}{4}$ guinea); 17gn; one marked 1 Dt. with a series of incuse dots, 24gn.
2. Tinplate weights, unmarked. 24gn.(1 dwt.); 23.5gn.(1 dwt.).
3. Lead weights, 3 unmarked. 326.5gn; 114gn; 123gn.(sovereign was 122.5gn.); 120gn.(5dwt.)stamped crudely 1.
4. Sheet brass weights, 2 unmarked. 18.5gn; 17.5gn; 24.5gn.(1dwt.) marked 1 in ink.
5. Coins filed down to make weights, one marked 2 DRAMS in ink on a paper label, 120.5gn; 85.5gn.
6. Copper wire weights, 11.5gn.($\frac{1}{2}$dwt.); 3gn; 3gn; Cut nail 3gn; A collar stud filed down to 61gn.($\frac{1}{2}$ sovereign); Sealing wax 48gn.
7. Apothecary weights and a coin cut or filed to make different weights, 73gn.(3 dwt); 128.5gn.also marked XX (20 shillings = guinea of mid 17th century; 48.5gn.(2dwt.); 24.5gn.(1dwt.).
8. Printer's type used as weights 68gn; 67.5gn; 61gn.($\frac{1}{2}$ sovereign = 62gn.); 53.5gn.(2 dram = 54.6gn.); 24gn.(1dwt.).

A ROMAN STEELYARD

BY Dr.A.ERAN.



The Kadman Numismatic Museum in Tel-Aviv owns a beam of an unequal-arm balance and a counterpoise apparently belonging to it. The beam is made of brass covered with patina and has three fulcri, but only the first suspension hook is extant. The fulcri are of the pin-and-ring pivot type, each pin being held by two raised walls astride a short channel in the appropriate face of the beam.

The load shackle is missing, so that we do not know whether the shackle held a pan or hooks. However, from the form of the beam end it can be clearly inferred how the load shackle was suspended from the beam: a deep groove around the beam enabled either a yoke, or a ring with a shackle hanging from it, to turn around the beam as required, when its suspension was changed from one hook to another.

The finials at the end of both arms of the beam form a cone, both rather large in proportion to the cross-section of the beam. The eyelet of the suspension hook is formed by bending back a rather long piece of its shaft.

In all features of the load arm, including the form of the suspension hook, this statera is very similar to instruments of Roman origin : to the statera found at Delos, to the instrument of Theodor at the Museum at Mainz, and the statera from Greece in the Antiquarium at Berlin - to cite only a few - all of which are, however, made of bronze and not of brass.

The counterpoise (a brass shell filled with lead) has the form of a double cone, proportioned like a pear, topped by a small barrel-like intermediary and a substantial lug. Its sliding hook is missing.

While the features of the load arm point to a late Roman or Byzantine period of origin, the counterpoise is not helpful in dating the balance. No specimen of a comparative form appears to have been published. The metrological measurements of the beam, on the other hand (taken in accordance with the suggestions of A.Mutz. Dr.Phil.h.c. Basel.), show a definite relation to the Roman system of length: the graduations on the beam extend very nearly to one pes, and the proportions of weight arm to load arm for the three fulcri are as follows (all in senunciae, i.e. 1/24 pes):

I 26:8 II 29:5 III 32:2

⊳

It follows that the metrological overall length of the beam is one pes et quincunx. In spite of all these pointers in the direction of a Roman or Byzantine origin for this statera, there remain doubts whether the instrument might not be the product of some border sphere - either in time or in space. A full investigation of its weighing capacity and the graduations may lead to further conclusions.

****

Dr. Abraham Eran was a collector of money scales and weights, but he now spends all his time researching ancient weights and balances in cooperation with archaeologists in Israel. He is not a member of ISASC but kindly gave permission for his article to be published. It first appeared in the Bulletin of the museum Haaretz, No. 11, Tel-Aviv, 1969.

Weighing up the terms

BY M.A.CRAWFORTH.

As with scalemaking, weighing terminology originated long ago. It has evolved and changed through the centuries, and inevitably, developments were not always uniform within the industry itself. Different scale making firms, often geographically far apart, developed their own terms which are a mystery to outsiders. A good example to illustrate the point, concerns the two-legged component containing the main bearings and by which an equal-arm beam is suspended. This part has many names ; shears, cheeks, gallows, forks, fulcrum shackle, and so on.

To complicate the matter further, there are international differences between the United States and the United Kingdom. However, both these countries have attempted standardisation, and the terms which appear in the following Glossary should be understood in any English speaking scale fraternity. The terms have been selected for their relevance to scale collectors and they include special names appropriate to letter and coin scales. Many obscure technical expressions have been omitted.

REFERENCES

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GLOSSARY OF TERMS for Weighing Apparatus

COMPILED BY M.A.CRAWFORTH

ACCELERATING BEAM - a scale beam which, when moved from the horizontal position, continues to move with accelerated velocity to its position of maximum tilt, where it remains until unloaded. Scales with this type of beam were used for rapid weighing where precision was of secondary importance, as for example in weighing coal. Also called an UNSTABLE WEIGHBEAM (USA). See also VIBRATING BEAM.

ACCURACY - the degree of agreement between the measured weight and the true weight (USA).

ADJUSTING HOLE - a hole in the underside of a weight into which a lead plug* was fitted for adjustment to the standard. Also called an ADJUSTMENT CAVITY (USA).

ADJUSTMENT CAVITY - see ADJUSTING HOLE.

'A' FRAMES - the metal frames supporting the beam of Roberval* letter scales, or similar instruments, Fig 1.

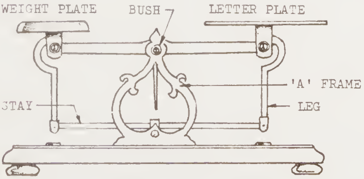
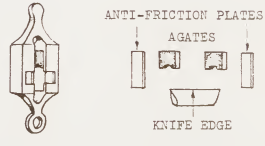


FIG 1. ROBERVAL LETTER SCALES



AGATE BOX

EXPLODED VIEW

FIG 2.

A.G. - Abgezogen Gewichte (German) = adjusted weight. See also R.A.

AGATE BEARING - a bearing* made from hard igneous rock and used for the pivots* of good quality small scales and precision balances* where resistance to corrosion was particularly important Fig 2.

AGATE BOX - the housing for an agate bearing*, typically seen on English shop scales, Fig 2. See also SHARKEY END.

ANALYTICAL BALANCE - a sensitive scale used for the analysis of materials in a laboratory. See also PRECISION BALANCE.

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* An explanation of the term marked * appears in the Glossary.

ANTI-FRICTION PLATE - a small plate of hard metal at the end of a bearing* which resists the sideways motion of the knife edge*, Fig 2. Colloquially called "FRICTIONS" in England. Also called a THRUST PLATE, END PLATE or END FRICTIONS (USA).

APPROVAL SEAL - see VERIFICATION MARK.

ARM - the distance between the main fulcrum* and a beam end pivot*. Fig 3. See also EQUAL ARM BEAM, UNEQUAL ARM BEAM.

ARRESTMENT GEAR - a mechanism which prevents movement of scale pans when they are not in use. It is commonly seen on precision balances* in the form of small metal pads which rise up from the baseboard below each pan, Fig 4. See also RELIEVING GEAR.

ARROW SCALE - a scale used in England for weighing the arrows for an archery contest. The receptacle for the arrow was a slender channel suspended by four cords, Fig 5.

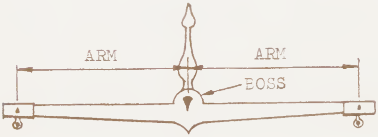

FIG 3a. BEAM

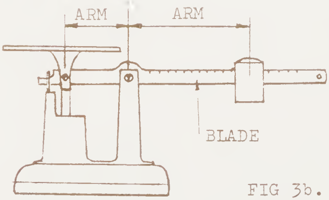

FIG 3b.

ASSAY BALANCE - a sensitive scale used in the analysis of gold, silver etc. to determine their purity or degree of alloying. Also called in old documents an ESSAY BALANCE. See also PRECISION BALANCE.

AUTOMATIC SCALE - a scale for industrial weighing which loads, weighs and discharges automatically. See also FOLDING GOLD BALANCE.

BALANCE - (1) the name for a weighing instrument, said to be derived from bi-lanx, the Latin for two pans. See also SCALE.

- (2) a state of equilibrium.

BALANCE BALL - (1) a weight used to adjust the balance of a beam before weighing, often in the form of a knurled nut on a threaded rod at the end of the beam, Fig 7a.

- (2) a hollow metal ball suspended from the end of an equal arm beam, or a steelyard. Lead shot is placed in the ball by scale adjusters for the adjustment of the balance, Fig 7b.

BALANCE BOX - a metal box fitted to a scale beam, or other moving part, and used to contain lead shot for adjustment of the balance. Also called a LOADING BOX (USA).

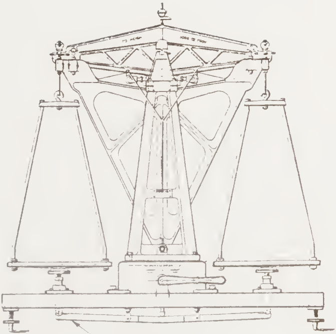

FIG 4. ARRESTMENT GEAR

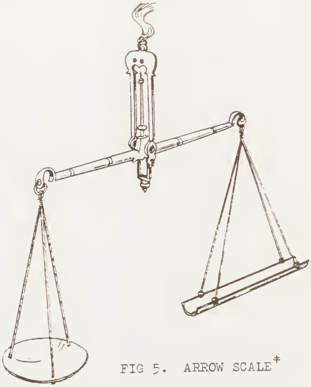

FIG 5. ARROW SCALE‡

BAND - a metal belt used to transfer motion between parts of a weighing mechanism, usually connecting the beam to the indicator*. Also called a RIBBON or TAPE (USA).

BEAM - a bar, or lever, suspended from a fulcrum* and carrying load pans, weight pans, hooks etc. Also called a SCALEBEAM or WEIGHBEAM (USA).

BEAM END - the fitting at the ends of a scale beam from which loads or weights are suspended. Various designs are shown in Fig 6.

1 Cord pivot end.*
2 Trumpet end* or Lotus end.
3 Ring-and-hole end.*
4 Hook end.*
5 Renaissance trumpet end.
6 Nuremberg end.
7 Swan neck end.*
8 German swan neck end.
9 German rivetted swan neck end.
10 Nuremberg swan neck end.
11 Double hole end.*
12 French double hole end.
13 Open double hole end.
14 Horned hole end.
15 Open box end.
16 Boxed swan neck end.
17 Box end.*
18 Antwerp box end.
19 Swan box end.
20 Spanish box end.
21 Cusp box end.
22 Berlin box end.
23 Dutch end.*
24 Sharkey end.*
25 Stirrup end.
26 Inverted swan neck end.*
27 Shackle end.*

BEAM SCALE - In England, an equal arm beam with hanging pans.
In America, a steelyard.

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‡ The only known example is in the Avery Historical Museum.

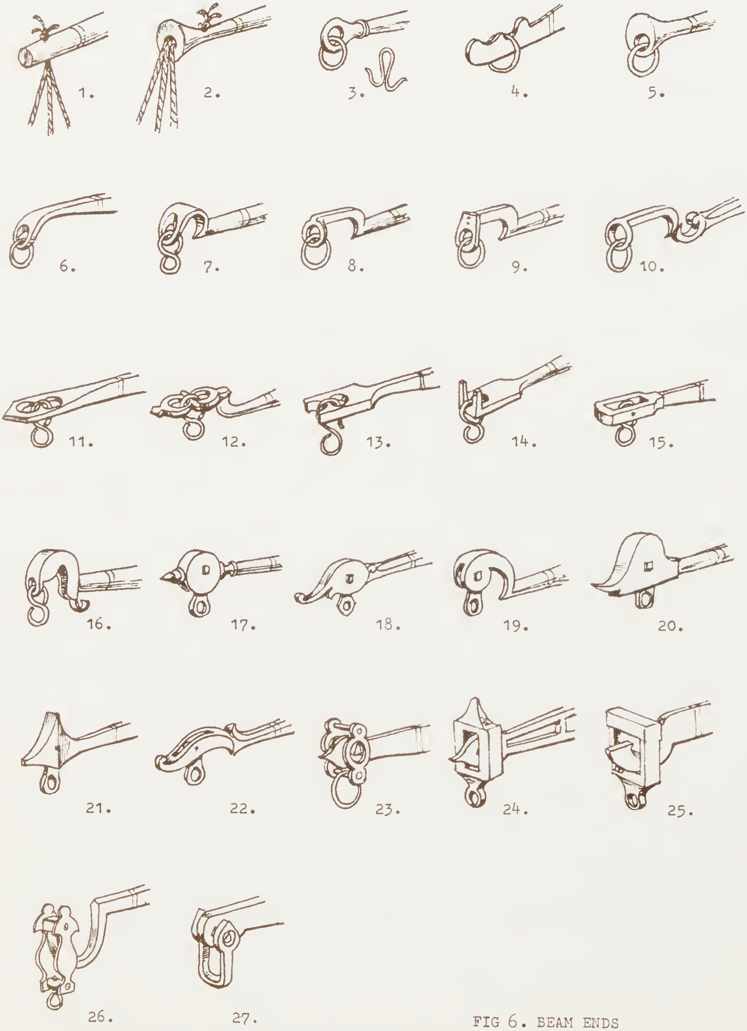

FIG 6. BEAM ENDS

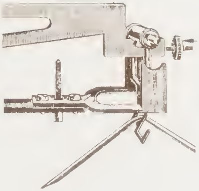

FIG 7a.

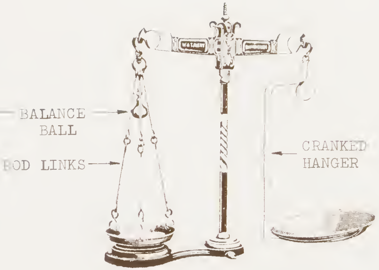

FIG 7b.

BEARING - The special surface on which a knife edge or pin pivot rotates.It is often a concave or vee surface made from hardened steel or agate*, Fig 2, or it is in the form of a hard steel bush* Fig 1. Some bearings may be simply a plain hole, as used on pendulum balances with pin pivots.

BENCH SCALE - see COUNTER SCALE.

BERANGER SCALE - a scale constructed on the principle patented by Joseph Beranger in 1847. The load and weight plates are supported above the beam by a series of parallel linkages designed to eliminate side forces on the knife edges (a disadvantage of the Roberval* system), Fig 8.

BILATERAL PENDULUM SCALE - see PENDULUM SCALE.

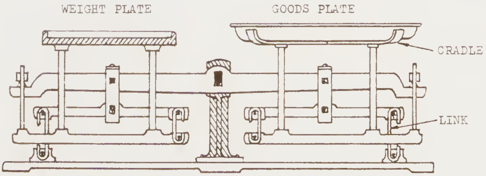

FIG 8. BERANGER SCALES

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* An explanation of the term marked * appears in the Glossary.

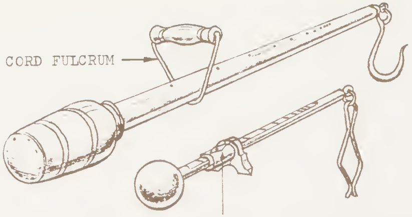

FIG 9. BISMARS

BISMAR - an unequal arm beam on which the weight and load hook have fixed positions. Equilibrium is achieved by moving the fulcrum which is often in the form of a loop of cord, Fig 9. The divisions* become closer together as the graduations* progress from light to heavy values, thus rendering the instrument inaccurate for heavier loads. Some modern bismars have, instead of a cord, a saddle* which slides along the beam, Fig 9.

BLADE - that part of a steelyard beam which normally carries the graduations; the long arm between the fulcrum* and the nose* Fig 3.

BORDA WEIGHING - see SUBSTITUTION WEIGHING.

BOSS - the enlarged part of the beam through which a knife edge is fixed, Fig 3.

BOX END - a beam end on which the knife edges are enclosed in a box-like housing in order to protect the pivots from dust and damage, Fig 6.

BRAIDED CORD - a cord having a plaited sheath over a central core of strands, usually made of silk. It was used on small hand held scales for weighing coins, medicines etc. See also TWISTED CORD.

BREVITÉ - patented (French).

BUSH - a hard metal bearing set into soft metal to reduce wear. e.g. a hardened steel bush, or ring, is set into brass shears*, Fig 1.

BUTTON PIVOT - see CONE PIVOT.

BUTTON BALANCE - an assay balance so called because of the tiny button shaped blobs of gold etc. which were required for analysis.

* An explanation of the term marked * appears in the Glossary.

CONTEMPORARY COMMENT

"Most of the storekeepers are purchasers of gold either for cash or in exchange for goods, and many are the tricks from which unsuspecting diggers suffer. One great and outrageous trick is to weigh the parcels separately, or divide the whole, on the excuse that the weight would be too much for the scales; and then, on adding up the grains and pennyweights, the sellers often lose at least half an ounce. On one occasion, out of seven pounds weight, a party once lost an ounce and three quarters in this manner. There is also the old method of false beams - one in favour of the purchaser - and here, unless the seller weighs in both pans, he loses considerably. Another mode of cheating is to have glass pans resting on a piece of green baize; under this baize, and beneath the pan which holds the weights, is a wetted sponge which causes that pan to adhere to the baize, and consequently it requires more gold to make it level; this, coupled with false reckoning, is ruinous to the digger. In town the buyers have a system of robbing a great deal from sellers before they purchase the gold dust (for in those instances it must be dust); it is thrown into a zinc pan with slightly raised sides, which are well rubbed over with grease, and under the plea of careful examination, the purchaser shakes and rubs the dust, and a considerable quantity adheres to the sides. A commoner practice still is for examiners of gold dust to cultivate long finger-nails, and in drawing the fingers about it, gather some up."

From 'The Goldfields Illustrated', Lansdowne Press, Melbourne, 1972.
(Sent in by Vernon Denford).

ISASC

EQUILIBRIUM

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

WINTER, 1979/80 M.A. CRAWFORTH, EDITOR PAGES 177-204

EDITOR'S COMMENT

Oval japanned sets

Guinea scales in oval japanned metal boxes are a much neglected field of British coin scales. The standard design, Fig 1. has a wood block drilled to accept two turned brass weights with stamps 5.8 and 2.16 for the guinea and half-guinea, after 1774. The boxes are usually covered with bright pink paper. Inside, the box and lid are [illegible] green baize and the lid with printed pink silk.

It is often hard to appreciate the quality of these boxes for one is usually looking at the box. When in good condition, the attractive appearance and feel fully justifies the high quality label which was often included.

There were many other weight arrangements within the box, some of which were illustrated by Sheppard and Musham. See the useful cross reference table by [illegible] on page [illegible].

It is hoped to feature a major article in a future issue.

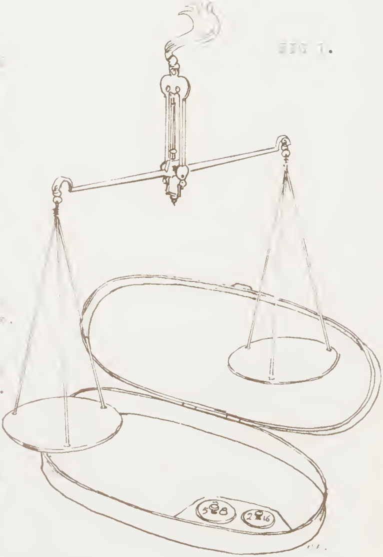

FIG 1.

COVER PICTURE

Two card handouts illustrating the advances in weighing made by the Fairbanks Company. The reverse side of the cards are illustrated in Figs 5 and 6 on page 182. See also, the reference on page 180.

INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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Symposium '79

PAPER PRESENTED
BY N.S.STURGESS

PAPERGOODS
A necessary part of a scale collection

Any collector who attempts to collect scales only, and who avoids collecting samples of the available papergoods that would support the hobby, is missing most of the fun of collecting. I would like to give you some idea of the various types of material that are available, by briefly covering the range of papergoods in this talk. Among the items to be covered are books, articles, sales catalogues, advertising material, indentures, receipts, postcards and old newspapers.

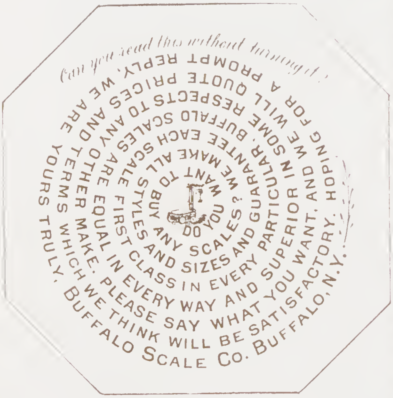

Can you read this without turning it?
DO YOU WANT TO BUY ANY SCALES? WE MAKE ALL STYLES AND SIZES AND GUARANTEE EACH SCALE FIRST CLASS IN EVERY PARTICULAR. BUFFALO SCALES ARE EQUAL IN EVERY WAY AND SUPERIOR IN SOME RESPECTS TO ANY OTHER MAKE. PLEASE SAY WHAT YOU WANT, AND WE WILL QUOTE PRICES AND TERMS WHICH WE THINK WILL BE SATISFACTORY. HOPING FOR A PROMPT REPLY, WE ARE YOURS TRULY, BUFFALO SCALE CO. BUFFALO, N.Y.

FIG 1.

There are a number of good books referring to our subject, but the number available is minute compared with those pertaining to many other types of antique collecting. Maybe you have looked at the bibliography of a scale book and have seen long lists of books that the author has read during the preparation of his work, and have reached the conclusion that it will be easy for you to find a large number of books. However, when you examine and analyse his list, you will find that most of the books are rather obscure, or that a book referred to has only a small section devoted to our subject. My bibliography gives you a short list of books available and in print, and some that I have in my own library. The comments about each book may help you to decide what to include in your own library. (see page 186).

In many cases you will encounter books with a chapter, or less, concerning scales and weights, so consider using a photocopy, rather than a purchase. When doing this, be sure to copy the title page to keep with the portion you have extracted, giving you a ready reference to the source of the material. Make sure that you also have the date of publication.

Closely associated with books are articles appearing in popular magazines or scientific journals. You often find that a photocopy is the only available method of acquiring this information. Again, be sure that you make a good reference to the source, in case you want to refer

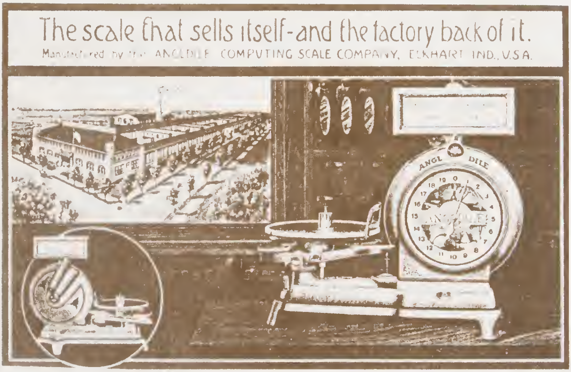

The scale that sells itself-and the factory back of it.
Manufactured by the ANGLDILE COMPUTING SCALE COMPANY, ELKHART IND., U.S.A.
ANGLDILE
ANGLDILE

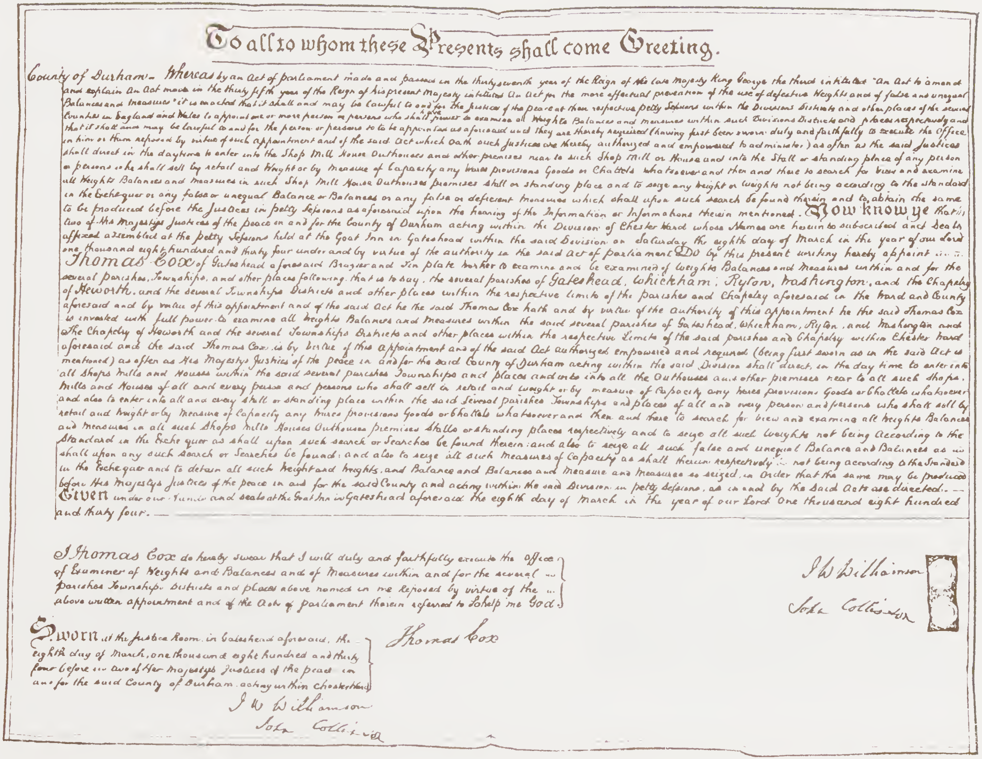
FIG 2.

back on it, or have future need to pass on the information to others in the field.

One of the best sources of usable material, and unfortunately, one of the hardest to find, is scale catalogues issued by the various scale manufacturers. Information can be extracted from these catalogues which includes pictures of the scales, specifications, their purpose and the original cost. Also, you have a grouping of scales available at a certain point in time, thus assisting you considerably in dating examples in your own collection. Fortunately, ISASC is planning the duplication of early catalogues which should be of enormous help and interest to all of us.

Nearly as exciting as the scales catalogues are the various handouts and small items of advertising material furnished by the scale companies. These items are not nearly as difficult to acquire as the scale catalogues, but are, of course, much narrower in their utility and interest. Several examples are shown in Figs 1,2,5,6,7 and the Cover. You will note that as far as they go in their content, they are very pleasing. Of course, your major aim would be to find one which applies to a particular scale in your collection. It is possible to find this type of material at postcard or paper shows, and normally they are not very expensive.

One of the most exciting and difficult items to acquire is an indenture pertaining to weights and measures. An indenture was a document, usually English, the purpose of which was to accompany and legalise a transaction. There were always two or more parts, and at the point where



To all to whom these Presents shall come Greeting.

County of Durham — Whereas by an Act of parliament made and passed in the thirty seventh year of the Reign of His late Majesty King George the third intituled "An Act to amend and explain An Act made in the thirty fifth year of the Reign of his present Majesty intituled An Act for the more effectual prevention of the use of defective Weights and of false and unequal Balances and Measures" it is enacted that it shall and may be lawful to and for the Justices of the peace at their respective petty Sessions within the Divisions Districts and other places of the several Counties in England and Wales to appoint one or more person or persons who shall have power to examine all Weights Balances and Measures within such Divisions Districts and places respectively and that it shall and may be lawful to and for the person or persons so to be appointed as aforesaid and they are thereby required (having first been sworn duly and faithfully to execute the Office in him or them reposed by virtue of such appointment and of the said Act which Oath such Justices are thereby authorized and empowered to administer) as often as the said Justices shall direct in the daytime to enter into the Shop Mill House Outhouses and other premises near to such Shop Mill or House and into the Stall or standing place of any person or persons who shall sell by retail and Weight or by Measure of Capacity any Wares provisions Goods or Chattels whatsoever and then and there to search for view and examine all Weights Balances and Measures in such Shop Mill House Outhouses premises Stall or standing place and to seize any Weight or Weights not being according to the standard in the Exchequer or any false or unequal Balance or Balances or any false or deficient Measures which shall upon such search be found therein and to obtain the same to be produced before the Justices in petty Sessions as aforesaid upon the hearing of the Information or Informations therein mentioned. **Now know ye** that we two of His Majestys Justices of the peace in and for the County of Durham acting within the Division of Chester Ward whose Names are herein to subscribed and Seals affixed assembled at the petty Sessions held at the Goat Inn in Gateshead within the said Division on Saturday the eighth day of March in the year of our Lord one thousand eight hundred and thirty four under and by virtue of the authority in the said Act of parliament **Do** by this present writing hereby appoint ... **Thomas Cox** of Gateshead aforesaid Brazier and Tin plate Worker to examine and be examiner of Weights Balances and Measures within and for the several parishes, Townships, and other places following, that is to say, the several parishes of **Gateshead, Whickham, Ryton, Washington,** and the Chapelry of **Heworth,** and the several Townships Districts and other places within the respective limits of the parishes and Chapelry aforesaid in the Ward and County aforesaid and by virtue of this appointment and of the said Act he the said Thomas Cox hath and by virtue of the authority of this appointment he the said Thomas Cox is invested with full power to examine all Weights Balances and Measures within the said several parishes of Gateshead, Whickham, Ryton, and Washington and the Chapelry of Heworth and the several Townships Districts and other places within the respective Limits of the said parishes and Chapelry within Chester Ward aforesaid and the said Thomas Cox is by virtue of this appointment and of the said Act authorized empowered and required (being first sworn as in the said Act is mentioned) as often as His Majestys Justices of the peace in and for the said County of Durham acting within the said Division shall direct, in the day time to enter into all Shops Mills and Houses within the said several parishes Townships and places and into all the Outhouses and other premises near to all such shops, Mills and Houses of all and every person and persons who shall sell in retail and weight or by measure of Capacity any Wares provisions Goods or Chattels whatsoever and also to enter into all and every Stall or standing place within the said several parishes Townships and places of all and every person and persons who shall sell by retail and Weight or by Measure of Capacity any Wares provisions Goods or Chattels whatsoever and then and there to search for view and examine all Weights Balances and Measures in all such Shops Mills Houses Outhouses premises Stalls or standing places respectively and to seize all such Weights not being According to the Standard in the Exchequer as shall upon such search or Searches be found therein: and also to seize all such false and unequal Balance and Balances as ... shall upon any such Search or Searches be found: and also to seize all such Measures of Capacity as shall therein respectively ... not being according to the Standard in the Exchequer and to detain all such Weight and Weights, and Balance and Balances and Measure and Measures so seized, in Order that the same may be produced before His Majestys Justices of the peace in and for the said County and acting within the said Division in petty Sessions, as in and by the said Acts are directed. — **Given** under our Hands and Seals at the Goat Inn in Gateshead aforesaid the eighth day of March in the year of our Lord One thousand eight hundred and thirty four. —

I **Thomas Cox** do hereby swear that I will duly and faithfully execute the Office of Examiner of Weights and Balances and of Measures within and for the several ... parishes Townships Districts and places above named in me Reposed by virtue of the ... above written appointment and of the Acts of parliament therein referred to So help me God.

Sworn at the Justice Room in Gateshead aforesaid, the eighth day of March, one thousand eight hundred and thirty four before us two of His Majestys Justices of the peace in and for the said County of Durham acting within Chester Ward

J W Williamson

John Collinson

Thomas Cox

J W Williamson

John Collinson

FIG 3.

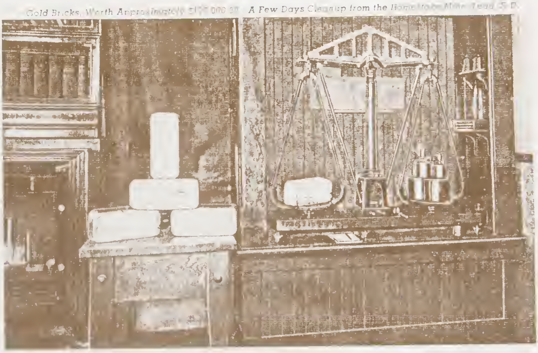
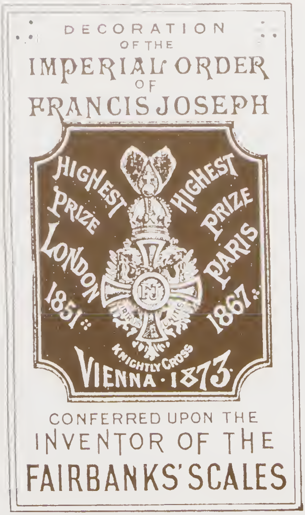

Gold Bricks, Worth Approximately $100,000.00 A Few Days Cleanup from the Homestake Mine, Lead, S. D.

FIG 4.

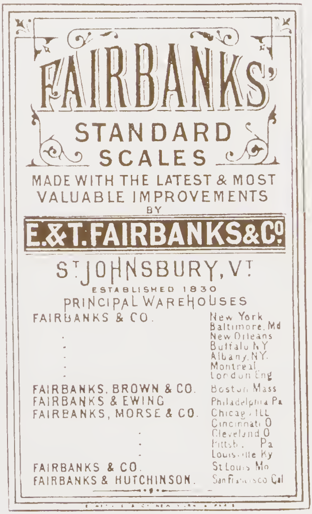


DECORATION
OF THE
IMPERIAL ORDER
OF
FRANCIS JOSEPH

HIGHEST PRIZE LONDON 1851
HIGHEST PRIZE PARIS 1867
KNIGHTLY CROSS
VIENNA · 1873

CONFERRED UPON THE
INVENTOR OF THE
FAIRBANKS' SCALES

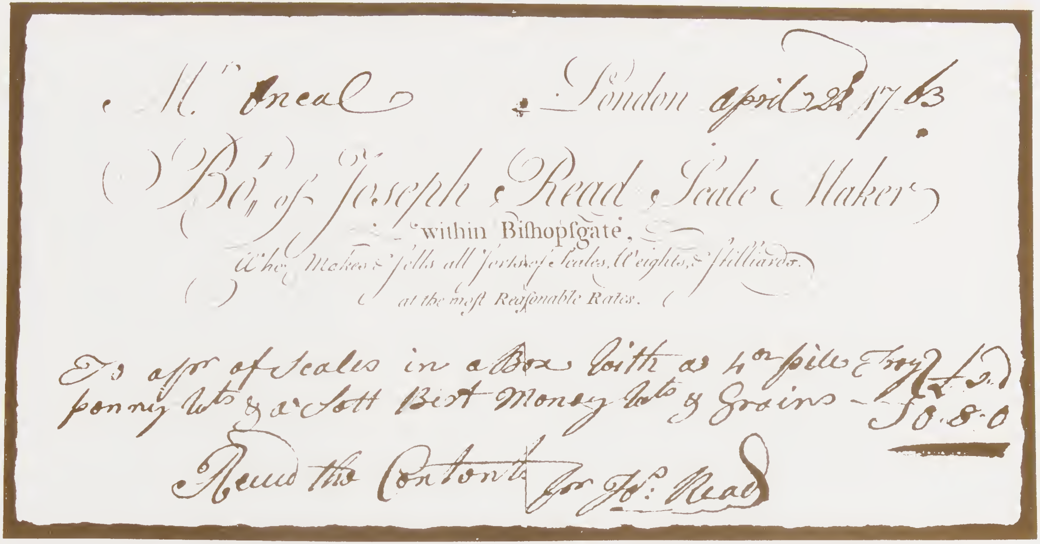
FIG 5.



FAIRBANKS'
STANDARD
SCALES
MADE WITH THE LATEST & MOST
VALUABLE IMPROVEMENTS
BY
E.&T. FAIRBANKS & Co.
St. JOHNSBURY, Vt.
ESTABLISHED 1830
PRINCIPAL WAREHOUSES

FAIRBANKS & CO.	New York
"	Baltimore, Md
"	New Orleans
"	Buffalo N.Y.
"	Albany, N.Y.
"	Montreal
"	London Eng
FAIRBANKS, BROWN & CO.	Boston Mass
FAIRBANKS & EWING	Philadelphia Pa
FAIRBANKS, MORSE & CO.	Chicago ILL
"	Cincinnati O
"	Cleveland O
"	Pittsb. Pa
"	Louisville Ky
FAIRBANKS & CO.	St Louis Mo
FAIRBANKS & HUTCHINSON.	San Francisco Cal

FIG 6.



Mr. Oneal London April 22 1763

Bot of Joseph Read, Scale Maker

within Biſhopſgate,

Who Makes & ſells all ſorts of Scales, Weights, & ſtilliards.

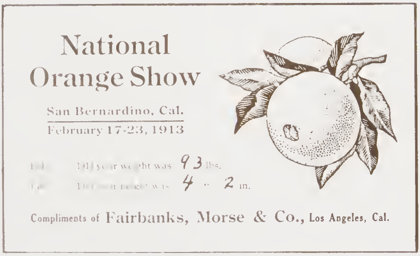
at the moſt Reaſonable Rates.

To a pr of Scales in a Box with a 4oz pile Troy penny wts & a Sett Best Money wts & Grains — £ s d 0.8.0

Recd the Contents for Jo: Read

FIG 7.

the parts of the document were originally attached you will see a jagged edge. This irregular cutting was done in order to authenticate the original unity of the two parts, whenever they were compared at some later date.



National
Orange Show

San Bernardino, Cal.
February 17-23, 1913

Feb.   191 your weight was 93 lbs.
Feb.   191 your height was 4 " 2 in.

Compliments of **Fairbanks, Morse & Co.,** Los Angeles, Cal.

FIG 8.

I have an indenture issued by the DeGrave scale company and which was shipped to the North Riding of Yorkshire accompanying a set of new Standards issued in 1853. This indenture remained with the Standards so long as they continued in use. The reverse side of the indenture was used to certify inspections of the measures.

Another fascinating document is a warrant appointing a Weights and Measures Inspector in the County of Durham, Fig 3. You will note that the recipient, Thomas Cox, was a tinsmith by trade. When acquired, the warrant was in a tin box with the appointment information and date painted in gold on the outside of the box, and one presumes that the box was made by Mr. Cox.

A further example is an original receipt issued to the purchaser of a scale made by Joseph Read and sold in 1763, Fig 7. This type of paper item is extremely rare and very desirable. It was purchased with a scale by Joseph Read, and one naturally assumes that the scale was the one referred to on the receipt - at least, it has the listed features. Fortunately, the price is included and this is very exciting in that it establishes the selling price for coin scales of that era.

The last items are postcards depicting scales, which are fairly easy to collect. My initial contact with dealers at postcard shows has shown that they had not thought of this as a category to segregate. Several dealers, once reminded of my interest, have been able to find suitable material when they examined their stock. Remember, the scales depicted may not actually exist in the exact form shown, as some of the cards are greetings and others joke cards, Fig 9. However, you can be certain that scales existed almost of the design shown.

In this discussion, I have made no attempt to include all the types of paperwork available. You will find, in your own research, that other types can be found, and that is the fun of it. Each individual paper that you add to your collection is just as important as the acquisition of a new scale or a new weight - in fact, far more so. It is possible that you are the first in our Society to acquire the information and you immediately have the obligation to share the information with ISASC. And just think how easy it is to photocopy the material and how hard it would be to copy a new scale !

****

Norman Sturgess started as a keen and knowledgeable collector of coins, but when he discovered money scales he rapidly changed his allegiance. He has a very select and specialised collection of English coin balances, about which his knowledge is deep and enthusiastic. His comprehensive library covers scales, weights and measures.

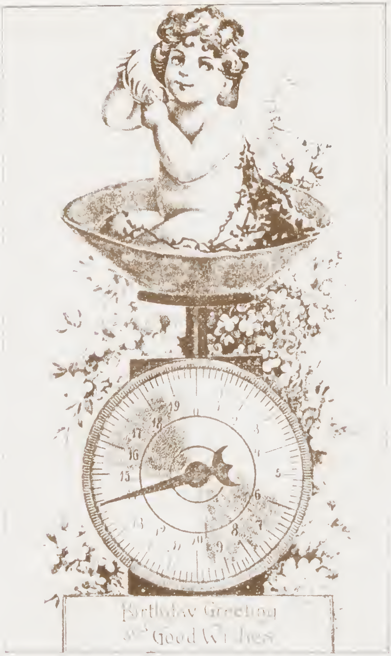


FIG 9

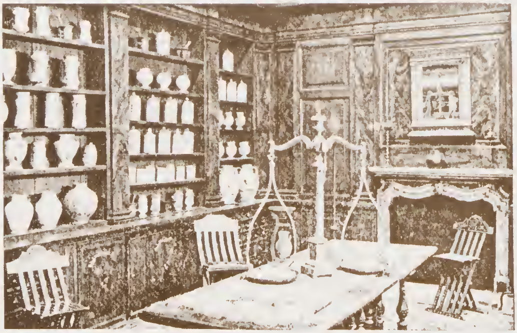


FIG 10.

A Section of CONTI'S OLD WORLD PHARMACY
With Original 17th Century Walnut Woodwork and Furnishings

PAPERGOODS - A BIBLIOGRAPHY

SCALES AND WEIGHTS, A HISTORICAL OUTLINE.
Bruno Kisch, Yale University Press, USA. $ 20. In print.

If there is one book that you should have in your library, this is the one. It is the only one I know which can act as the foundation of a collection. Mr. Kisch, at the time curator of the Streeter Collection of Yale University, prepared a book which gives a brief history of scales and weights, an account of the beginnings of the metric system, identification of makersmarks, tables of weights and a dictionary of units of weight. All in all, an invaluable book for the collector.

MONEY SCALES AND WEIGHTS.
T.Sheppard and J.F.Musham. Spink & Son Ltd. England, Reprinted 1975.

A 'must' for the scale collector who has any interest in money scales or weights. The only book in print, or out of print, that concentrates on the two subjects. The book is divided into two parts, the first with detailed descriptions of money scales, the second on coin weights.

A DICTIONARY OF ENGLISH WEIGHTS AND MEASURES.
Ronald E.Zupko. University of Wisconsin Press, USA. $ 19.50 In print.

This dictionary attempts to include all weight terms of English origin from Anglo-Saxon times to the 19th century. Crammed with information from many sources not available to the average collector.

HISTORICAL METROLOGY.
A.E.Berriman. Greenwood Press, USA. 1953 reprinted 1970. $ 14.25.

Another historical book on scales and weights. It predates Kisch's book, and concentrates more on the earlier period. When it gets into the more modern era almost all material is English. An excellent book and a necessity to round off your collection.

GEWICHTE UND WAAGEMACHER IM ALTEN KOLN.
Dr. Bruno Kisch. Verlag der Lowe, Cologne, Germany 1960. Out of print.

Fortunately for the German collector, printed in German. Unfortunately for me I don't read it, and frankly purchased it for two reasons, first because it was an earlier work by Kisch, and second, because it has numerous excellent pictures of early German weights and scales and many useful dates.

MANUEL DES POIDS MONETAIRES.
A.Dieudonné. Paris, France 1925. Out of print.

And this one is in French. But again, it is the only book concentrated on money weights. Even if you don't read French, there are many excellent plates showing nearly 500 money weights. Recommended.

DEVELOPMENT OF THE CHEMICAL BALANCE.
John T.Stock. HMSO, London. 1969 Out of print.

An excellent paperback book covering precision balances largely from the collection of the Science Museum, London. Only 50 pages, but a very useful reference book; recommended.

OLD ENGLISH BRONZE WOOL WEIGHTS.
Maj. Herbert C.Dent. H.W.Hunt, Orford Hill, Norwich, England 1927. OOP.

A rare but necessary book if you have any interest in the extremely narrow subject of English wool weights. A limited edition of only 200 copies, it has 32 pages of text and about the same of plates. Very rare (if you need this information I will be glad to xerox it for you).

THE STRIFE OF SCALES IN THE CITY OF LONDON.
J.A.Kingdom. Rixon and Arnold, London. 1905. Out of print.

An attempt to explain how the King's Weigh-house and beams within the City of London, came in to the charge of the Worshipful Company of Grocers. It covers the period 1256 to 1350. Rather short, 78 pages, but quaint and interesting. Covers the withdrawal of the bismar from legal use.

WEIGHING AND MEASURING.
H.W.Chisholm. Macmillan & Co. London. 1877. Out of print.

Most of the book covers a history of standards from ancient times to the date of the book. The last chapter is basically instruction in the methods and applications of weighing. It is a book I enjoy in my library and I recommend it.

THE STORY OF STANDARDS.
John Perry. Funk & Wagnalls, USA 1955. Out of print.

This is the story of what standards are, how they began, who made them, and how they have changed our lives. An excellent book in that it sticks to its subject and provides background essential to the collector. It largely covers American standards, but since most books on weights and scales are English or European, it is all the more essential to your collection.

SALTER, THE STORY OF A FAMILY FIRM.
Mary Bache. Geo. Salter & Co. Ltd. West Bromwich, England. 1960 OOP.

All of you who have spring balances in your collection must have examples of Salter manufacture. This book, written by a member of the family for the 200th anniversary of the firm, is a 'must' for collectors, including as it does, many helpful dates.

THE CONSTRUCTION OF THE BALANCE.
E.Brauer. Incorporated Society of Inspectors of Weights and Measures, London. Translation by N.C.Walters, 1909. Out of print. ⊳

I guess the best description of the content would be to quote the long title, "The Construction of the Balance according to underlying scientific principles and according to its special purpose. For use by manufacturers of weighing instruments, as also for technical colleges and schools." The book is liberally illustrated with drawings and is useful in any scale collector's library. It is especially helpful that it is available in two languages, German editions 1880, 1887 & 1906.

EARLY ARABIC GLASS WEIGHTS AND STAMPS.
Geo.C.Miles. 1948, Ditto, a supplement 1951.

CONTRIBUTIONS TO ARABIC METROLOGY I.
Geo.C.Miles. 1958, Ditto, II 1963.

The books from Numismatic Notes and Monographs, Nos 111, 120, 141 and 150, were all published by the American Numismatic Society. All deal with Arabic glass weights and give excellent coverage of the subject.

THE UNIVERSAL CAMBIST
P. Kelly, London. 1821. Out of print.

Typical of the books of the period is that the full title of the book gives an excellent explanation of the content: "The Universal Cambist and Commercial Instructor; being a full and accurate treatise on the Exchanges, Monies, Weights, and Measures, of all trading nations and their colonies; with an account of their banks, public funds, and paper currencies." Of all the books that I accessed in libraries this was the one that I most wanted for my collection, and after a 5 year wait I was successful. I can recommend this book highly.

THE MEASURES, WEIGHTS AND MONIES OF ALL NATIONS.
W.S.B.Woolhouse. John Weale, London. 1859. Out of print.

Another book covering the various measures and monies of the world. If you can't find a copy of the Cambist, this book would be acceptable as a substitute, although it is not as complete. Covers the period 50 years later than the Cambist.

THE ECONOMIST GUIDE TO WEIGHTS AND MEASURES.
The Economist, 22 Ryder St. London. 20th century. Out of print.

Completes the series on weights and measures beginning with the Cambist.

BRITISH WEIGHTS AND MEASURES. A History from Antiquity to the 17th C.
Ronald E.Zupko. University of Wisconsin Press, USA. 1977. In print.

This book is a follow-up of Zupko's dictionary. It includes about 100 pages of the history of British Weights and Measures, and it is refreshing to read the views of a 20th century author on the subject. Also contains several very useful listings, including a very extensive bibliography. Recommended.

FRENCH WEIGHTS AND MEASURES BEFORE THE REVOLUTION.
Ronald E.Zupko. Indiana University Press, USA. 1978. In print.

More of Mr. Zupko's careful research into weights and measures. This book could more directly be titled a Dictionary of French Weights and Measures. Recommended.

A TREATISE OF WEIGHTS METS AND MEASURES OF SCOTLAND.
Alexander Hunter. 1624. Reprinted Walter J.Johnson Inc, USA 1974.

A curiosity, but a chance to own a reprint of an early book at a much lower price than the original. Recommended.

REPORT OF THE SECRETARY OF THE TREASURY ON THE CONSTRUCTION AND DISTRIBUTION OF WEIGHTS AND MEASURES.
Anon. A.O.P.Nicholson, Printer. 1857. Out of print.

An official Executive Document (No. 27), concerning the preparation and distribution of standards of weights and balances to various American States and Custom Houses. Recommended.

PROCEEDINGS OF THE AMERICAN METROLOGICAL SOCIETY.
Published by the Society in 1880. Out of print.

Pamphlets covering the minutes and reports from 1873 to 1878, bound as a book. Subjects relating to Standards, interesting and useful.

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Books printed since Norman Sturgess wrote his article :- Editor.

DIE WAAGE DES CHEMIKERS.
Hans R.Jenemann. Dechema, Theodor-Heuss-Allee 25, D-6000 Frankfurt, West Germany. 1979. DM 10. In print.

A beautifully produced 83 page paperback, lavishly illustrated with pictures tracing the history of precision balances. An important work by a specialist in the field (and a member of ISASC). Even if you can't read German, it is well worth having for the pictures. Recommended.

WEIGHING COINS - ENGLISH FOLDING GOLD BALANCES OF THE 18th AND 19th C.
Michael A.Crawforth. Cape Horn Trading Co. 12 New Row, Covent Garden, London. 1979. £15. In print.

A comprehensive survey of the spring-into-position guinea and sovereign balances, with maker's dates and charts for the identification of maker's work. Many good illustrations including rare examples. (See Review on page 135).

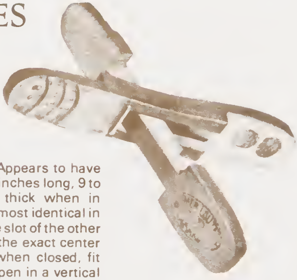
VETERAN SCALES AND BALANCES.
Brian Jewell. Midas Books, Speldhurst, Kent, England. £3.50. In print.

Good text covering the historical development of scales. Many pictures. Some glaring errors. Good value for money. (See Review on page 139).

EXTRACT FROM A LETTER OF 1977

A FEW OF OUR SCALES

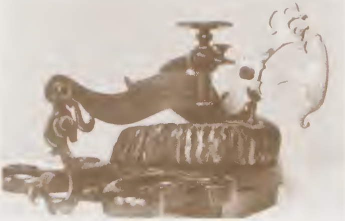
BY D.A. & J.S. COLKER

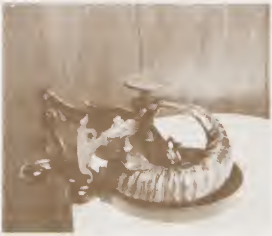


A 19th century coin scale originating in East India. Appears to have been hand carved from a hardwood and measures 3¾ inches long, 9 to 11/16ths inches wide, and 5 to 7/16ths inches thick when in completely closed position. There are two members almost identical in shape and dimensions except that one piece fits into the slot of the other piece at the center and a pin joins the two pieces at the exact center point. Thus, they form a + when fully open and when closed, fit together very snugly. When either member is held open in a vertical position, the other member swings freely but hangs low on one side because of small lead weights buried near one end. The opposite end of the hanging cross piece is carved with a series of three steps ascending towards the center. These steps are marked with numbers designating a particular coin. The lightest coin obviously would be set into the outer most step and be counter balanced by the opposite side lead weights so that the member would return to a horizontal position. Thus, the device is actually for determining if a coin is true and with 3 steps on each arm, a total of 6 coins can be judged. I am not familiar with the markings but the six are 88, 100, 110 and 44, 51 and 55.

Other markings carved into the wood can be seen in the reproduction.

I will be pleased to learn if any of my esteemed colleagues would provide more information on this scale.*



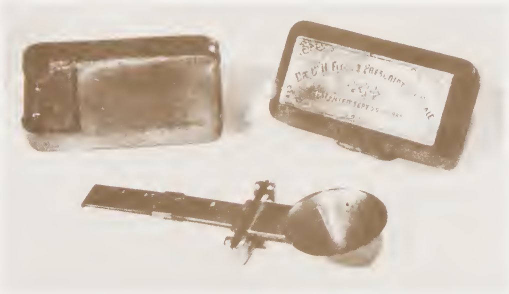


This must be the most unusual scale I have ever seen and appears to be homemade, possibly not duplicating any other device of this kind. There is a handcarved wooden base supporting the entire mechanism with two extending carved wooden scrolls forming an open slot through which hangs the weighing hook. Mounted on the base is a natural rams horn, heavily varnished, which acts as the spring component (it is fairly stiff now). Upon the horn and base are mounted beautifully hand-fashioned brass pieces depicting exotic birds or fish. One arm has one end fastened down to the center of the wood base through a pinned clevis. It extends out over the horn in carved fashion and ends with a double brass pin to which is attached the hook for the object to be weighed.

A brass clamp attaches to the above beam for a fulcrum point and simultaneously holds the upper end of the ram's horn. A small adjusting screw is mounted on the tip of the horn.

A separate fixed arm is fastened at the base of the horn and extends out at a 90° angle to the first arm. The outer arc of this arm appears to be a brass dolphin on which graduations are inscribed starting with one pound at the lower end. Pinned against this fixed arm is another carved brass figure which can swing freely. Contact will be made at the inside end of this loose arm by the adjusting screw on the upper tip of the horn. Movement of the horn will cause the screw to move the free swinging segment which in turn will move its outer end indicator over calibration readings.

The entire base measures about 13 inches by 8½ inches and to the top of the brass plate above the tip of the horn is approximately 6¼ inches. I was told this scale was made by a tobacco importer in England to weigh hanks of tobacco but I have no verification. Perhaps one of you can help?



A very simple steelyard-type scale that can be easily disassembled and carried in a compact tin box by a traveling physician so that he can prepare his prescriptions on the spot. A metal pan has an extension arm to which is fastened a cross piece containing steel knife edges. The extension piece is also formed to accept a flat, steel member calibrated in grains (up to 20) and with a sliding counter balance weight. When assembled, the knife edges are mounted in a sturdy U-shaped base. The box cover reads "Dr. C. H. Fitch's Presription Scale, patented Sept. 29th, 1885".

David and Jean Colker are true partners in life, work and collecting. They have to travel extensively and collect selectively en route, particularly unusual devices in boxes or leather cases.

* * *

*The marks on the Colker's cruciform balance were for checking the weight of Turkish, Greek and Egyptian coins, and the marks are in piastres : The Turkish Lira of 100 and 51 p, the Greek 20 drachma and 10 drachma pieces of 88 and 44 p, and the Egyptian Lira and half-Lira of 110 and 55 piastres. Some examples were marked in Arabic numerals ٤٤ , ٥٠, ٥١, ٥٥, ٨٨ , ١٠٠ , ١١٠, being the equivalent of 44,50, 51, 55, 88, 100, 110 respectively.
Editor.

CALIBRATE - to mark graduations* on a weighing device by reference to known standards.

CAM-AND-PENDULUM - a scale mechanism which uses a cam to obtain equally spaced divisions*, instead of the unequal ones which result from the use of a simple pendulum, Fig 10. Typically used for fan chart* counter scales*, industrial platform scales, and coin freed* person scales. See also PENDULUM.

CAM SCALES - a scale in which the weight is suspended by a flexible metal band* which passes round a cam, Fig 11. The cam provides the increasing resistance required to balance the load. The load may also be applied via a band attached to a cylindrical drum. An alternative arrangement has the load band on the cam and the weight band on the drum. Typically used on industrial platform scales.

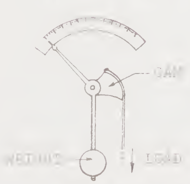


FIG 10. CAM & PENDULUM

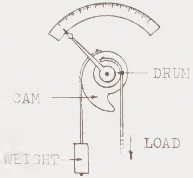


FIG 11. CAM SCALE

CAPACITY - the heaviest specified load for which a scale is constructed. The performance of a scale is defined by its capacity and its sensitivity*.

CARRIER - a frame fixed around a steelyard beam to prevent excessive movement of the beam, Fig 14.

CFS - see CUT-FROM-SOLID

CHAIN BALANCE - A weight in the form of a loop of chain hanging at one end from a scale beam, and at the other end from a drum. Rotation of the graduated drum adjusts the length of chain suspended, thereby adjusting the balance. The chain eliminates the use of minute weights and provides quick adjustment, Fig 12. A graduated slide was sometimes used instead of the drum.

CHART - a graduated surface used in conjunction with a pointer* or indicator*. It may be circular (dial), a segment of a circle (fan*), cylindrical, or a segment of a cylinder. See also QUADRANT.

CHECK - see STAY.

CHEEKS - see SHEARS.

CHEMICAL BALANCE - see PRECISION BALANCE.

CHONDROMETER - see GRAIN SCALE.

CLASS A, B, C. - the Board of Trade classification for equal-arm* beam scales, according to their sensitivity etc, when used for trade purposes, and when subject to the approval of Weights and Measures Inspectors. A similar system was used in the USA.

CLOTH SCALE - see YARN BALANCE.

COCK - see POINTER.

COCKING SCALE, COCKING WEIGHTS - scales and weights used for weighing cocks when matching protagonists in cock-fighting, in 18th and 19th century England.

COIN FREED SCALE - a person scale which is freed for operation by inserting a coin in a slot. Also called COIN OPERATED or MONEY OPERATED SCALES.

COLLAR - a raised band, or ring, around a scale beam or pointer, used for decoration, Fig 13.

COLUMN - a vertical rod, or pillar, used to support a scale, Fig 7.

COMMODITY PLATTER - see GOODS PLATE.

COMPOUND LEVER SCALES - a scale having two or more levers working together, as in platform scales, Fig 14.

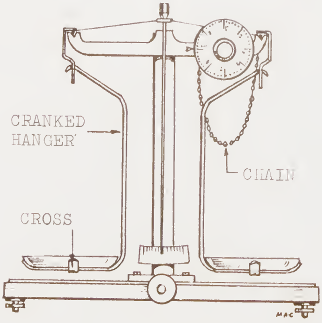


FIG 12. CHAIN BALANCE

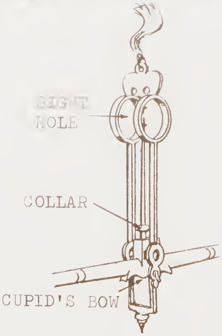


FIG 13.

COMPRESSION SPRING SCALE - a scale in which the spring resistant* is shortened, or compressed, by the action of weighing, Fig 16. See also TENSION SPRING SCALE.

COMPUTING SCALE - a scale which indicates the price of the goods being weighed, at various rates per unit of weight. See also ESTIMATING SCALE, COUNTING SCALE.

CONE PIVOT - a pivot in the form of a cone, instead of a knife edge*, often with a cup bearing*, Fig 17. Also called a BUTTON PIVOT (USA).

CONSTANT LOAD BALANCE - see SUBSTITUTION BALANCE.

CONTINUOUS KNIFE EDGE - a knife edge pivot in which the full length of the knife is in contact with a single bearing* as compared with a knife edge which passes through the beam so that only the ends rest on the bearings, two of which are required, Fig 18. See also STIRRUP END, INVERTED SWAN NECK.

CORD PIVOT - a pivot formed by passing a cord through a hole in the beam in such a way that the flexing of the cord forms the pivot, Fig [illegible]. Probably the first form of pivot used in weighing, and still used in primitive societies. See also TRUMPET END.

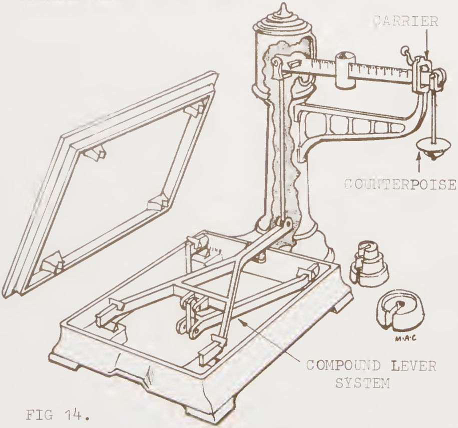


FIG 14.

* An explanation of the term marked * appears in the Glossary

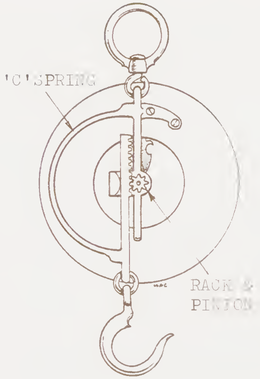


FIG 15. 'C' SPRING BALANCE

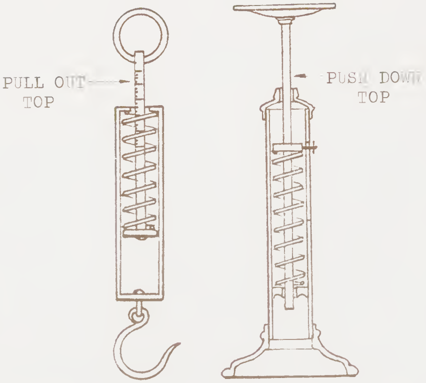


FIG 16. COMPRESSION SPRING BALANCES

CORN SCALE - see GRAIN SCALE.

COTTON BEAM, COTTON SCALE - a steelyard adapted for weighing bales of cotton (USA).

COUNTERBALANCE - see COUNTERPOISE.

COUNTERFEIT COIN DETECTOR - a weighing, or weight-proving* instrument which incorporates either a gauge for testing the size of the coin, or with facilities for weighing the coin immersed in water. By these means, a counterfeit coin of the correct weight, but made of, or alloyed with, base metal, can be detected. See also HYDROSTATICAL SCALES, COIN GAUGE.

COUNTERPOISE - a weight suspended from the end of a steelyard to obtain a balance when the scale is unloaded. It is often attached to a hanger*which serves the additional purpose of carrying proportional weights* for weighing, Fig 14. Also called a COUNTERBALANCE (USA).

COUNTER SCALE - a scale intended for use on the counter of a shop or warehouse. Also called a BENCH SCALE (USA).

COUNTING SCALE - a scale, generally with an unequal-arm beam of specific ratio*, whereby one article is balanced against a larger number of identical articles. E.G. a beam with a ratio of 1 : 100 'counts' a hundred articles. Commonly used in ironmongery for counting nails, screws etc. Fig 19.

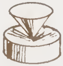


FIG 17. CONE AND CUP

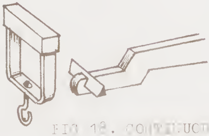


FIG 18. CONTINUOUS KNIFE EDGE

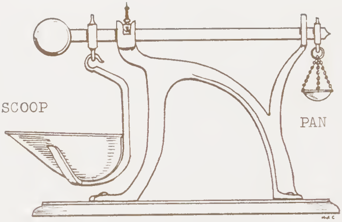


FIG 19. COUNTING SCALE

CRADLE - A frame which supports the goods plate or weight plate on a Beranger* or [illegible]* scale. Fig 8.

CRANKED HANGER - see HANGER.

CROSS - A cruciform support for a removable pan to rest on, usually at the bottom of a hanger*, Fig 12. See also SPIDER.

C - SPRING BALANCE - a spring balance where the resistant* is shaped like a letter 'C', Fig 15. The term is sometimes used to describe a rancour* balance.

CUP BEARING - a dished bearing used with a cone pivot*, Fig 17.

CUP WEIGHTS - see NESTING WEIGHTS.

CUPID'S BOW - a decorative bow, or bracket shape, typically under the central boss* of English coin scales, Fig 13.

CURRENT WEIGHT - the lowest weight at which a coin is legally allowed to pass at its face value, taking into account the loss in weight due to normal wear. For example, a new guinea weighed 5 dwts 9½ grains, but worn guineas were legally accepted at 5 dwts 8 grains, after 1774.

CUT-FROM-SOLID - a scale box which has been dug out from a single piece of wood, and typically used for coin scales. Abbreviated to CFS, see also MADE-UP-BOX.

CYPHER - (1) a symbol. E.G. the monarch's initials VR, GR etc.
- (2) zero, as used in the instructions for folding gold balances*.

* An explanation of the term marked * appears in the Glossary.

LETTERS

FROM M.PIERRON. ROBERVAL

I have read with pleasure and great interest, your article on the Roberval balance. I would like to draw your attention to an extract from the work by Machabey 'Memoire du l'histoire de la Balance' 1949, where you will find precise dates :

> "Gilles Person de Roberval discovered the principle of the balance which bears his name. He presented a prototype to the Academie des Sciences in 1670. However, it appears that Roberval's invention inspired scalemakers across the Channel before their French colleagues; from 1803, Merlin working in Strasbourg, made and sold this apparatus under the name 'English Balance'. He had to wait until 5th Dec, 1840, for the first ministerial decree authorising the admission, verification and stamping of Roberval balances."

REPLY

The reference to Merlin's Roberval scales is very interesting and is certainly the earliest I have heard of. There seems to be some disagreement about the date of Roberval's presentation of his invention. Six of the sources I used have the date 1669 (O'Keefe, Benton, Sanders, Heaberle, Encyclopaedias Britannica and Chambers). Only Owen and Machabey have the date 1670 - who is correct ? Editor.

FROM B.BRASS. OVAL JAPANNED BOXES

I felt it might be of assistance to members to provide a cross-index to the box types described in Sheppard and Musham's "Money Scales and Weights". I have found that the chart below has saved me many hours of perusal in attempting to locate and identify scales acquired.

The 'type' refers to the number of the illustrations on pages 77 and 78. The 'scale numbers' refer to the individual S & M catalogue numbers as set out in the book.

It is odd to note that no scale is listed for type 1,7,8,or 18. It would be interesting to learn from members if any of them have scales of these varieties.

TYPE	SCALE No.	TYPE	SCALE No.	TYPE	SCALE No.
1	–	9	95,107,109	17	144
2	139,140,146,147	10	94	18	–
3	98,133	11	91,119,124,142	19	138
4	116	12	86,88,100,108,145	20	137
5	93,135	13	143	21	85
6	131	14	136	22	141
7	–	15	87		
8	–	16	132		

FROM B.BRASS. SECRETARY EXTRAORDINAIRE

I was intrigued by the set of index cards provided by Bob Stein, which is far superior to the old membership list, and I should like to congratulate him on a first rate job. Not only has he taken on the unenviable task of Chairman, but as Secretary Extraordinaire he has certainly proved his worth by producing the 'box of cards'. How many members, I wonder, appreciate the hours of work that goes into the maintenance of such a register, for not only has it to be compiled, but it has to be kept up to date. Endorsed wholeheartedly - Ed.

PATENTLY INTERESTING

In 1860, [illegible] Richard Hall of Rosherville, Northfleet in Kent, took out patent No.751 for a small pendulum balance. He described it as working "on the principle of the steelyard" but with an enlarged heavy end to the beam instead of a sliding weight. The beam was to be made of sheet metal and when loaded it tilted up until the point of equilibrium was reached. A freely suspended pointer had a weight at the bottom, so that it always remained in the vertical position. This pointer registered on graduations inscribed around a circle on the heavy end of the beam.

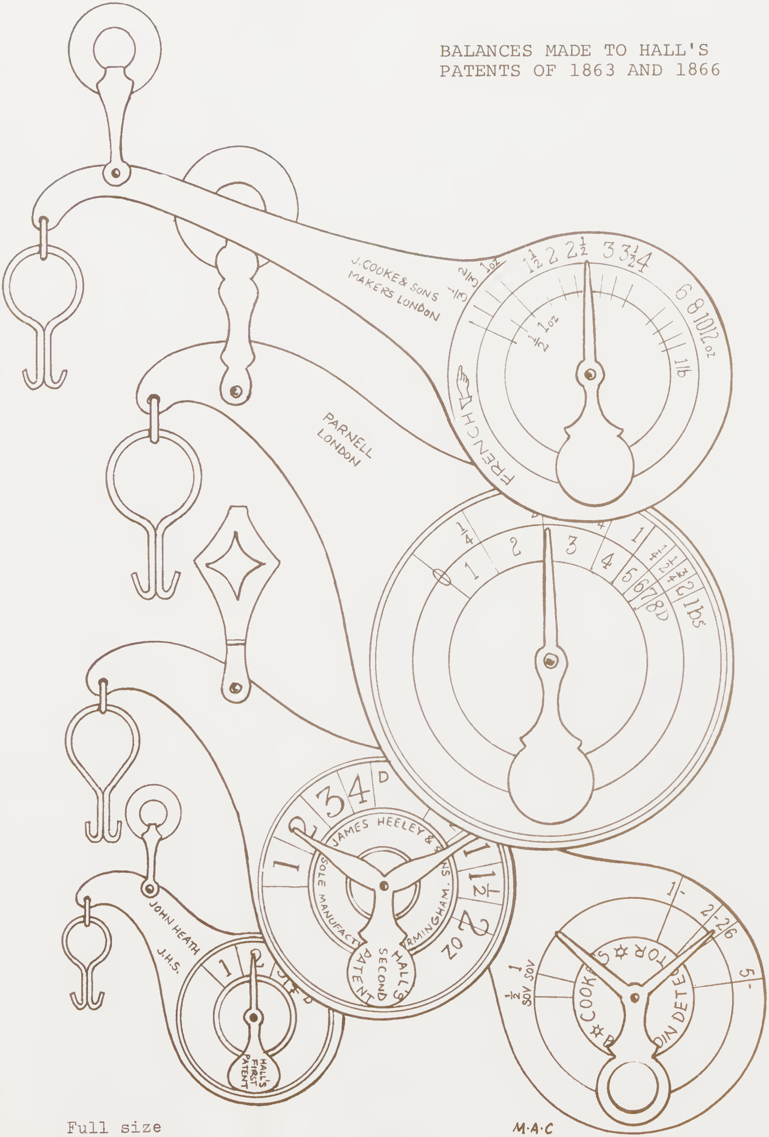
Any suitable load could be attached to the beam by means of "a clip with hooks (or any convenient contrivance ...)". The example given in the patent was a letter clip, and the use of postage charges or prices of goods, in addition to the weight, was suggested.

The principle of the pendulum balance had already been in use for over a century, so Hall's claim to a patent was for the circular enlargement of the beam and the pendulous pointer.

Three years later, in 1863, Hall took another patent, No.543, for improvements to his balance. The new idea was to form "the gravitating hand with two, three or more radiating pointers", and "increasing the range and number of scales so that wide spaces can be left between the graduations...and larger, more distinct figures marked..."

Some of the pendulum letter balances based on Hall's patents, and made by J.Cooke & Sons, Parnell, John Heath and James Heeley & Sons, are illustrated on page 199. A rare example of "Cooke's Base Coin Detector" is also shown. Readers of John Mussell's article (in Art & Antiques Weekly, Feb. 1977) will recall the magnificent colour photograph of Parnell's balance mounted on an ornate cast brass stand in the form of an eagle on the branch of a tree. The balance was suspended from the eagle s beak, and the entire instrument was gilded. Large versions of Hall's balance were mounted on plain stands and used for weighing parcels, (an example can be seen in the Avery Historical Museum). It is also said that a sturdy adaptation of the balance was made for use by anglers. A modern version, made of silver, was still being manufactured in 1975 by Christofle of Paris.

BALANCES MADE TO HALL'S
PATENTS OF 1863 AND 1866



Full size

RARE FOLDERS

BY M.A.CRAWFORTH

Since writing my book about folding gold balances, I have come across two more rare and interesting variations. The first set was made by Hamlet Bell, and had the unusual feature of a single compound weight for the guinea, half-guinea and seven shillings piece, Fig 1. The latter coin was introduced in 1797. This interesting set shows that Bell was wrestling with the problem of conserving space much earlier than the 1820's (when he made sets with two compound weights for the guinea, sovereign and their subdivisions).

The second set was made with six weights, instead of the normal five, the extra one being for the double sovereign, Fig 2. The double sovereign was coined from 1823 to 1826, but it had a very short life, being liked only by collectors ! The maker of this balance is not known, but it is in the 'Birmingham Style'.

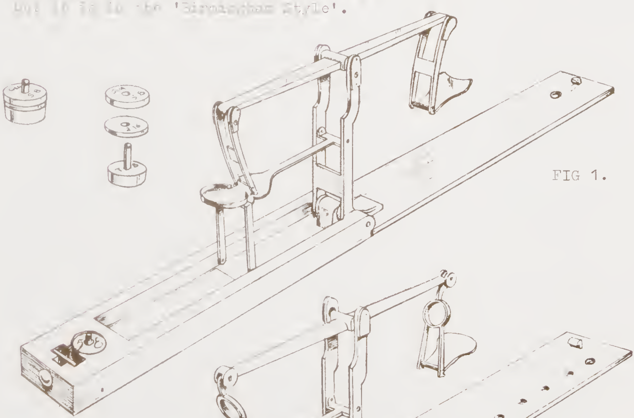


FIG 1.

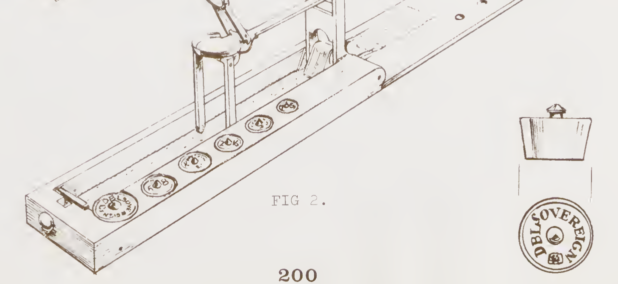


FIG 2.

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* References marked * include an illustration.

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bal. = balance: det. = detector:
mkr. = maker: mks. = marks:
rev. = review: sc. = scale:
wts. = weights: